

KODAK X-OMAT M43, M43A, and Clinic 1 Processors



HEALTH SCIENCES

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PROGRAM INFORMATION

Introduction



Read First

It is important to read this page before beginning your training.

Intended Audience

This self-study training workbook is intended for both users of the processors and service providers for the processors who have no previous experience with automated film processing.

Purpose of this Program

This Self-Study Program provides instruction on the skills required for servicing the *Kodak X-Omat M43A, M43 and Clinic 1 Processors*. Topics covered include:

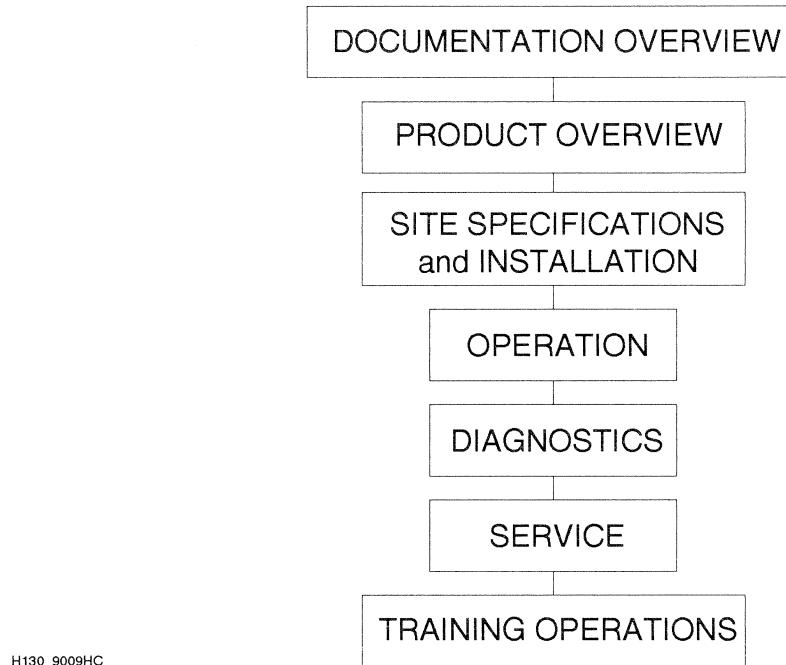
- Service Documentation Overview
- Installation Procedures
- Service Procedures
- How to Operate the Processors
- Training Customer Operators

How to Use this Self-Study Program

Make sure you have the required materials for this Training Package:

- Begin with this Training Workbook.
- Progress sequentially from the beginning to the end of the workbook.
- Follow all of the directions given in the workbook.
- Refer to the service documentation when directed to do so.
- Complete the fill-in-the-blank information in the practice sections of the workbook.
- After completing each Training Module, complete the evaluation for that Module.
 - Use your notes and documentation to complete these evaluations.
- Use the answer key following each course evaluation to monitor your progress.
- If you do not correctly answer the number of questions specified for a particular course evaluation, please review the materials for that module.
- **You are responsible for monitoring your progress. Do not proceed until you can satisfy the requirements for each Module's Course Evaluation.**

Course Map



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DOCUMENTATION OVERVIEW

Objectives

After completion of this module, students will be able to accomplish the tasks listed below:

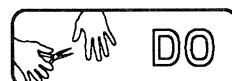
- Identify the correct publication for finding given topics and procedures.
- Identify the number for ordering Service Documentation and Accessories.

Service Manual Contents



Open your publications binder and locate the following contents.

- Operator Manual
- Replenishment Rates/Blink Patterns Sheet (in front cover pocket)
- Publication Parts Number List (in front cover pocket)
- Site Specifications
- Installation Instructions
- Service Procedures
- Theory Guide
- Diagnostics Manual
- Component Locator
- Diagrams
- Parts List
- Modifications Tab
- Newsletters Tab
- Misc. (Miscellaneous) Tab



Remove the Replenishment Rates and Blink Patterns Sheet from the inside front cover pocket.

Individual Sheets of Service Information



Reference Sheet on Replenishment Rates and Error Blink Codes (Pub. No. 1C0578)

- Lists replenishment rates for the processor.
- Identifies errors associated with blink patterns.

Listing of all Publications (Pub. No. 1C0581)

- Lists service publications and their associated part numbers.
- Lists Installation Instructions for the Accessory Kits and their associated part numbers.
- Lists Replenishment Rate/Blink Code Reference Sheet and its part number.

Operator Documentation



Remove the Operator Manual from the binder and examine its contents.



Operator Manual (Pub. No. 981089)

- Provides an overview of the product. Topics covered include a product description, a listing of optional accessories, a description of the operator display and various setup options.
- Describes the replenishment solutions required for developing film in the processor.
- Describes the procedures the operator performs in mixing and adding the solutions to the tanks.
- Provides routine operating instructions.
- Explains daily and periodic preventive maintenance procedures.
- Details problem solving methods based on observation of LED patterns or mechanical symptoms.

Service Documentation



Kodak Field Engineers and dealer service personnel will need to review the contents of the following:

Site Specifications (Pub. No. 981087)

- Details space requirements so site planners can allow sufficient service access to provide a safe, efficient, servicing environment.
- Explains power requirements for correct electrical connections.
- Describes the ventilation requirements for adding fresh air and removing exhaust fumes to maintain safe operating conditions.
- Outlines water inlet locations and pressure requirements.
- Shows the drain location on the machine.

Installation Instructions (Pub. No. 981088)

- Gives step by step instructions for installing the processor.
- Identifies special tools that the installer must bring to accomplish the installation in the indicated time interval.
- Illustrates steps to facilitate an efficient, error free installation.

Parts List (Pub No. 981091)

- Lists all spare parts available from Service Parts Management.
- Locates each part on an exploded parts illustration.
- Provides alphabetic and numeric indexes for a desired part.

Diagram Package (Pub. No. 981092)

- Provides electrical circuit board layouts and schematic diagrams.
- Provides test point locations for interpretation of circuit activity during operation.

Component Locator (Pub. No. 981094)

- Provides Plug and Jack locations for electrical connectors.
- Provides Switch, Circuit Board, Motor, Heater and other serviceable component locations.

Service Manual (Pub. No. 981090)

- Identifies special tools used to service the processor.
- Provides removal procedures for disassembly of assemblies and components.
- Provides adjustment procedures and factory specifications.

Theory Guide (Pub. No. 981095)

- Explains the technology used in the processor.
- Describes the sequence of operations of the processor.
- Details machine control logic in flow chart form.

Diagnostics Manual (Pub. No. 981093)

- Explains Status Indicator Code Patterns.
- Describes the hierarchy of fatal errors.
- Describes procedures used to remedy errors at the operator and service level.
- Provides tables which explain LED status indicators and possible corrective actions.
- Provides tables with mechanical failure indicators and possible prescriptive actions to remedy them.

Modifications

- Provides reasons and instructions for installing safety or upgrade changes.

Newsletters

- Provides update information for authorized dealers and Kodak service personnel.
- Provides interim information between service manual updates.

Additional Publications

Dealer personnel can also purchase a Footprint (Pub. No. 990623) which provides dimensions of the equipment as a full size template, and helps installers plan their installation.

Self Evaluation

Discover some of the service publication content, topics, and procedures by completing the following exercise. Check the table of contents in each document first and then explore the document's pages for answers to the multiple choice questions below.

Note:

- Check the **Answer Key** for the correct answers.
- You should answer at least **8 out of 10** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 1 again if you answered more than 2 questions incorrectly.

Multiple Choice Test

Module 1 Course Evaluation

See the Answer Key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. You would look here to find a schematic of the input power circuit?
 - a. Blink Pattern Sheet
 - b. Diagnostic Manual
 - c. Diagram Package
 - d. Theory Guide
2. An operator calls to report a blink pattern that is appearing on the front panel. Which of these publications contains tables which describe actions to take to correct the condition?
 - a. Listing of all Publications for the *Kodak X-Omat M43, M43A, and Clinic 1 Processors*
 - b. Component Locator
 - c. Installation Instructions
 - d. Operator Manual

3. The requirements in which publication should be met before scheduling the installation?
 - a. Site Specifications
 - b. Theory Guide
 - c. Parts List
 - d. Service Manual
4. Which of these publications contains the most direct information about the technology used in the processor?
 - a. Diagnostics Manual
 - b. Service Manual
 - c. Parts List Manual
 - d. Theory Guide Manual
5. The chart showing the switch positions for available diagnostic tests is found in which of these publications?
 - a. Diagram Package
 - b. Diagnostics Manual
 - c. Theory Guide
 - d. all of the above manuals
6. Which publication provides numerical and alphabetic indexes for parts?
 - a. Parts List
 - b. Listing of all Publications for the *Kodak X-Omat M43, M43A, and Clinic 1 Processors*
 - c. Service Manual
 - d. Diagram Package
7. A service person, running test film, hears an unusual motor noise after feeding film. Which manual should the service person check first for a possible corrective action for the symptom?
 - a. Service Manual
 - b. Parts List
 - c. Theory Guide
 - d. Diagnostics Manual

8. Which of these publications gives step by step instructions for electrical and plumbing connection procedures and information on how to fill the tanks with solutions?
 - a. Site Specifications
 - b. Reference Sheet on Replenishment Rates and Error Blink Codes
 - c. Listing of all Publications for the *Kodak X-Omat M43, M43A, and Clinic 1 Processors*
 - d. Installation Instructions
9. In which publication can you find the procedure for setting the developer temperature?
 - a. Installation Instructions
 - b. Operator Manual
 - c. Accessory Kit
 - d. Site Specifications
10. In which publication can you find the recommended volume of fixer replenishment for the Clinic 1 Processor?
 - a. Installation Instructions
 - b. Operator Manual
 - c. Reference Sheet on Replenishment Rates and Error Blink Codes
 - d. Site Specifications

Multiple Choice Test - Answer Key

Check your answers to the Module 1 Course Evaluation. Review Module 1 again if you did not answer 8 out of 10 questions correctly.

Module 1 Course Evaluation Answers

- (1) **c. Diagram Package**
- (2) **d. Operator Manual**
- (3) **a. Site Specifications**
- (4) **d. Theory Guide**
- (5) **d. all of the above manuals**
- (6) **a. Parts List**
- (7) **d. Diagnostics**
- (8) **d. Installation Instructions**
- (9) **a. Installation Instructions**
- (10) **c. Reference Sheet on Replenishment Rates and Error Blink Codes**

PRODUCT OVERVIEW

Objectives

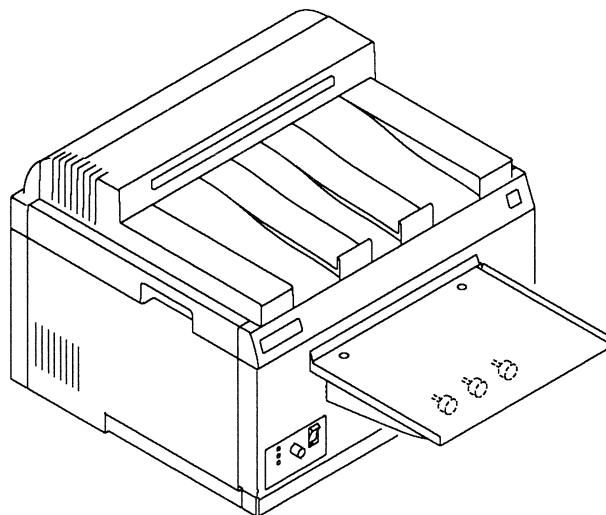
After completion of this module, students will be able to do the following tasks:

- Explain product features, benefits, and models.
- Identify the marketplace for this processor.
- Identify each subsystem within the processor and state its contribution to the overall function of the processor.
- Describe the film travel and sequence of operation for the processor and its subsystems.
- Explain the main drive system.
- Explain the film detection process.
- Describe processing and processor operation.
- Describe the processor heating/cooling system.
- Explain replenishment.
- Identify processor plumbing.

Product Features and Benefits

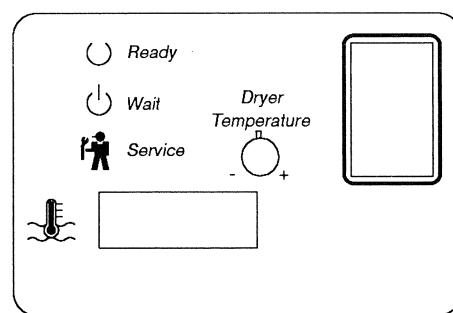


The *Kodak X-Omat* M43, M43A, and Clinic 1 Processors are compact, table-top processors used for processing medical x-ray Films.



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Figure 1 *Kodak X-Omat* Clinic 1 Processor



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Figure 2 *Kodak X-Omat* M43, M43A Front Display Panel

Market Segmentation



Market Segmentation by Power Requirements

The following table describes United States vs. World market segmentation by comparing each processor's power requirements.

Available X-Omat PROCESSOR Models		
<i>Kodak X-Omat</i> Clinic 1 Processor	115V	available for US
<i>Kodak X-Omat</i> M43 Processor	230V	available for worldwide distribution outside of the US
<i>Kodak X-Omat</i> M43A Processor	115V	available for US, Canada and Japan

Market Segmentation by Cost/Feature

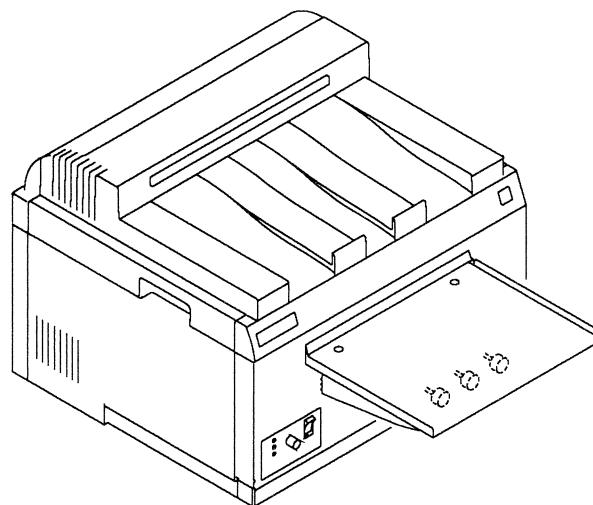
The following list describes features associated with the processors. Although the Clinic 1, M43, and M43A Processors are all intended for low volume users, the Clinic 1 Processor has fewer features and a lower cost than the others.

- The Clinic 1 Processor is designed for the non-hospital imaging market. This includes:
 - Private Practitioners
 - Clinics
 - Podiatrists
 - Chiropractors
 - Veterinary Clinics
 - Hospital related, off-site clinics

- The M43 and M43A Processors are designed for hospital applications with low volume film processing requirements.
These applications include:
 - Surgery
 - Low-Volume Emergency Room
 - Therapy
 - Ultrasound
 - Nuclear Medicine
- Some private practitioners with large practices or several doctors working out of a single office may desire the added features available with the M43 and M43A Processors.

The following table identifies probable marketplaces for the processors.

Processor Marketplace	
<i>Kodak X-Omat Clinic 1 Processor</i>	US professional non-hospital locations
<i>Kodak X-Omat M43 Processor</i>	Worldwide hospital market, except the US
<i>Kodak X-Omat M43A Processor</i>	US, Canadian and Japanese hospital market

M43/M43A and Clinic 1 Features and Benefits

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The processor

- is a desk top unit, that weighs under 115 kg (250 lb) with solution tanks full
- accepts 10 x 10 cm to 35 x 43 cm (4 x 4 in. to 14 x 17 in.) films
- accepts tri-fold film 35 x 90 cm or 35 x 128 cm (14 x 36 in. or 14 x 51 in.)
- has built-in error indication and service routines
- handles up to 6000 sheets per year
- conserves water: uses significantly less water than the M35 series of processors
- provides a choice of normal or flooded replenishment systems
- automatically exits standby mode when it senses film
- provides a simple operator interface
- provides an optional, single-sheet, lighttight feed tray capability for increased operator productivity
- allows an operator to load and unload film from the front of the unit
- processes a 14 x 17 in. sheet of film in 127 seconds (dry to dry, leading edge in to trailing edge out)
- has a fast feed tray clearance time (35 seconds)
- is easily calibrated for replenishment
- was originally designed for darkroom installations, but may also be installed through-the-wall by using the optional kit

Features/Benefits Comparison

The following table compares features and benefits among the three processors:

Table 1 Comparison of *Kodak X-Omat* Processors

M43	M43A	Clinic 1
230 V AC 50/60 Hz	115 V AC 50/60 Hz	115 V AC 50/60 Hz
Developer Temperature Display	Developer Temperature Display	No Developer Temperature Display
Diverter Valve	Diverter Valve	No Diverter Valve
Fixer Heat Exchanger	Fixer Heat Exchanger	No Fixer Heat Exchanger
Measures Film Area for Replenishment	Measures Film Area for Replenishment	Measures Film Length for Replenishment
Drip Tray Provided	Drip Tray Provided	Drip Tray Not Provided
Splash Guard Provided	Splash Guard Provided	Splash Guard not Provided
Install Kit Provided	Install Kit Provided	Install Kit Ordered Separately

Processor Subsystems



Refer to the section of the Theory Guide titled “Basic Principles of Film Processing.” The subsection titled “The Processor” describes the 4 different sections of the processor. Answer the fill-in question based on this information.



Fill-In Practice Exercise

1. The four subsystems described in this section are:



Fill-In Practice Exercise Answers

1. The four sections described in this section are:

Developer
Fixer
Wash
Dryer

Film Transport

The Processor uses roller transport technology to reliably process sheet film in sizes ranging from 10 x 10 cm to 35 x 43 cm (4 x 4 in. to 14 x 17 in.), as well as, Tri-fold film 35 x 90 cm or 35 x 128 cm (14 x 36 in. or 14 x 51 in.).

The purpose of the film transport is to:

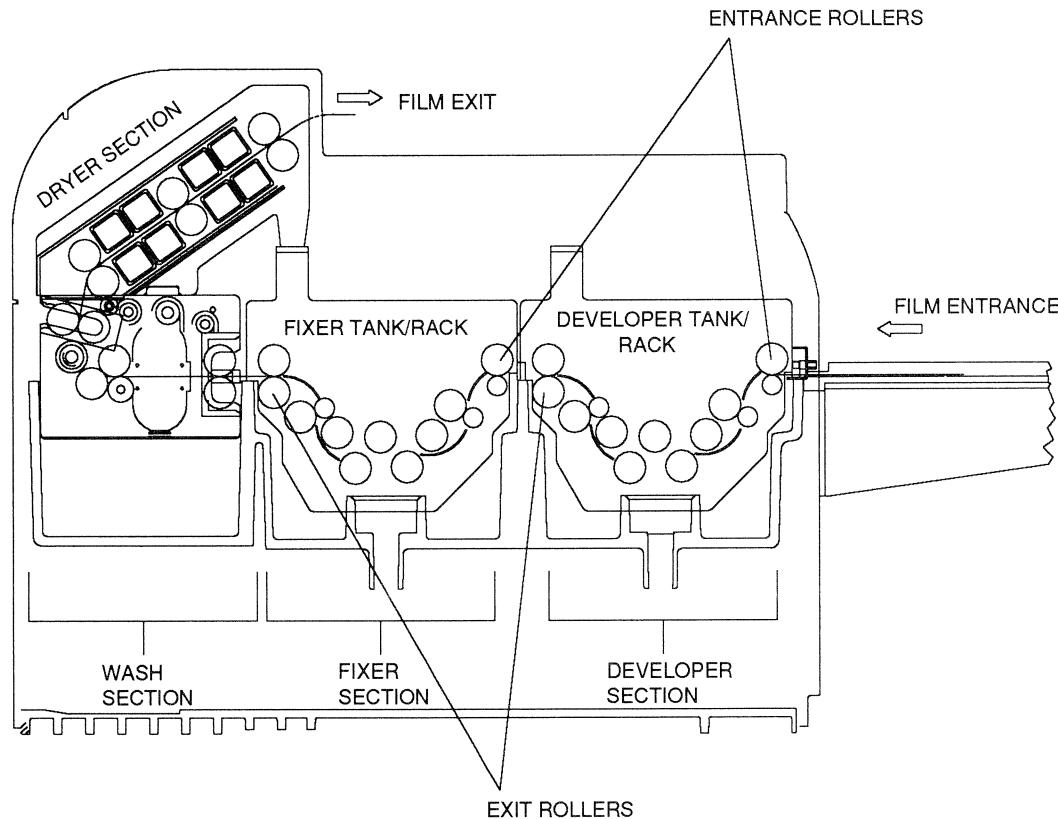
- transport film through processing chemicals
- provide primary source of agitation that exposes the film to the recirculation of chemicals in each tank
- control the time the film is in each processing chemical solution so the film can be developed with consistent quality
- expose the film to heated air for a controlled length of time to remove moisture from the film and transport it out of the processor

The film transport cycle for the M43/M43A and Clinic 1 Processors is described below.

- Film enters the processor from the feed tray.
- The main drive system transfers motion through worm gears.
 - Each set of worms/gears transfers power from the main drive motor to the processor transport rack assemblies (1 set each for developer and fixer racks).
- The developer rack moves the film through the developer tank.
 - Rollers guide the film through the developer rack.
 - Squeegee rollers remove excess solution from the surface of the film.
- The fixer rack moves the film through the fixer tank.
 - Rollers guide the film through the fixer rack.
 - Squeegee rollers remove fixer solution from the film.
- The film enters the wash system.
 - The film goes through the wash tubes.
- The film turns and enters the dryer.
- The film exits on top of the processor into the receiving tray.

Identifying the Film Path

The following figure illustrates the film path through the subsystems of the processor.

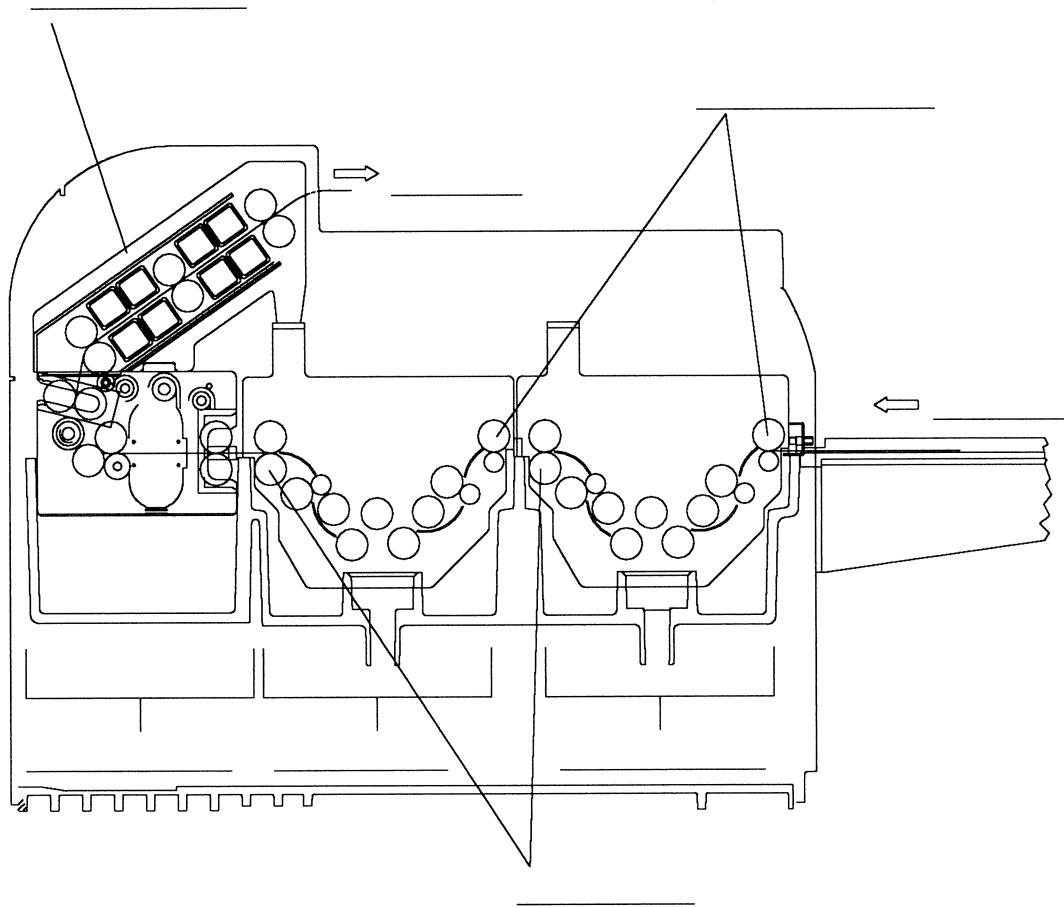


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H130_0166DA

Film Transport Cycle

PRACTICE
EXERCISE

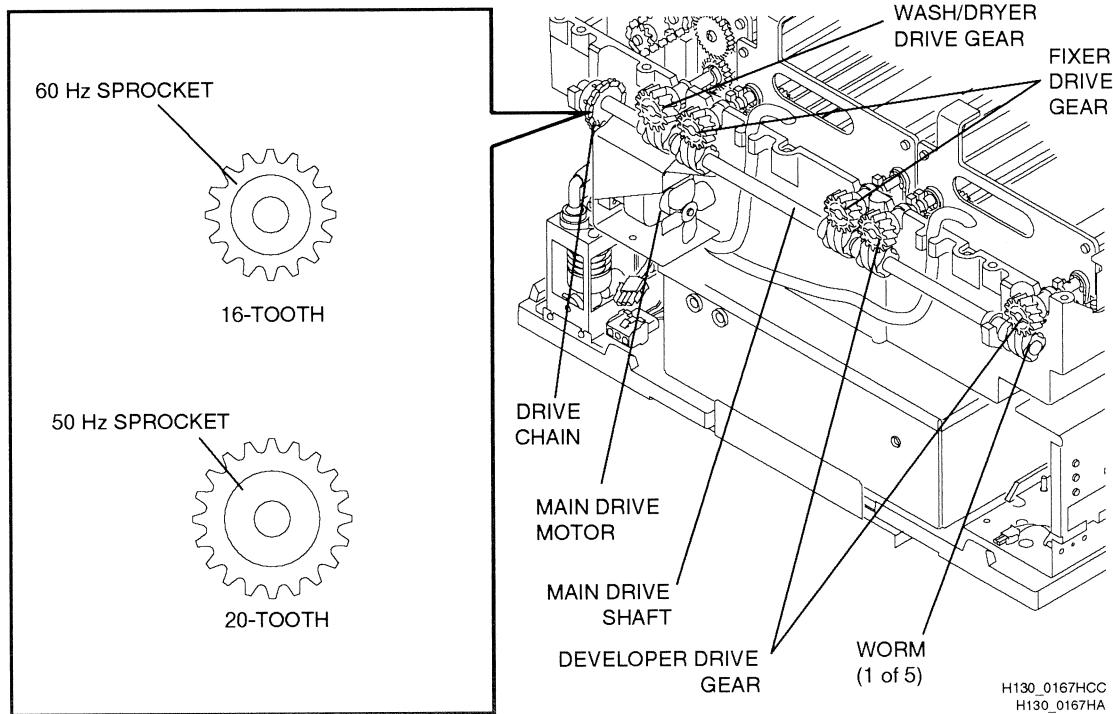
Fill-in the missing labels in the figure. Refer back to the figure on page 23 for the answers.



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H130_0166DA

Identifying Film Transport Components

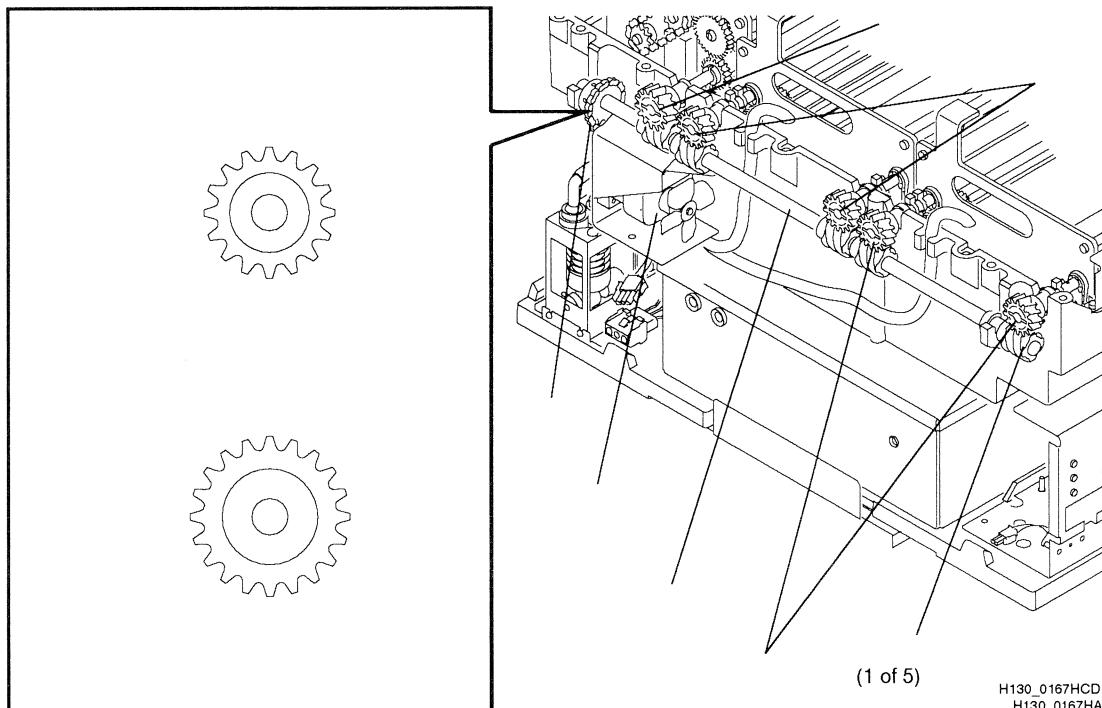
The following figure illustrates the film transport components that move the film through the processor.



Film Transport Cycle

**PRACTICE
EXERCISE**

Fill-in the missing labels in the figure. Refer back to the figure on page 25 for the answers.



Sequence of Operation



Overview

The 3 diagrams in this overview do not describe the complete sequence of operations for the processor. The control logic used for all aspects of the processor's operation is necessarily complex and beyond the scope of this training. However, the information provided in these diagrams covers entering and exiting standby mode, as well as, the basic temperature control logic. You will learn more about how the processor monitors and controls its internal devices as you progress through this Self-Study program.

Entering and Exiting Standby Mode

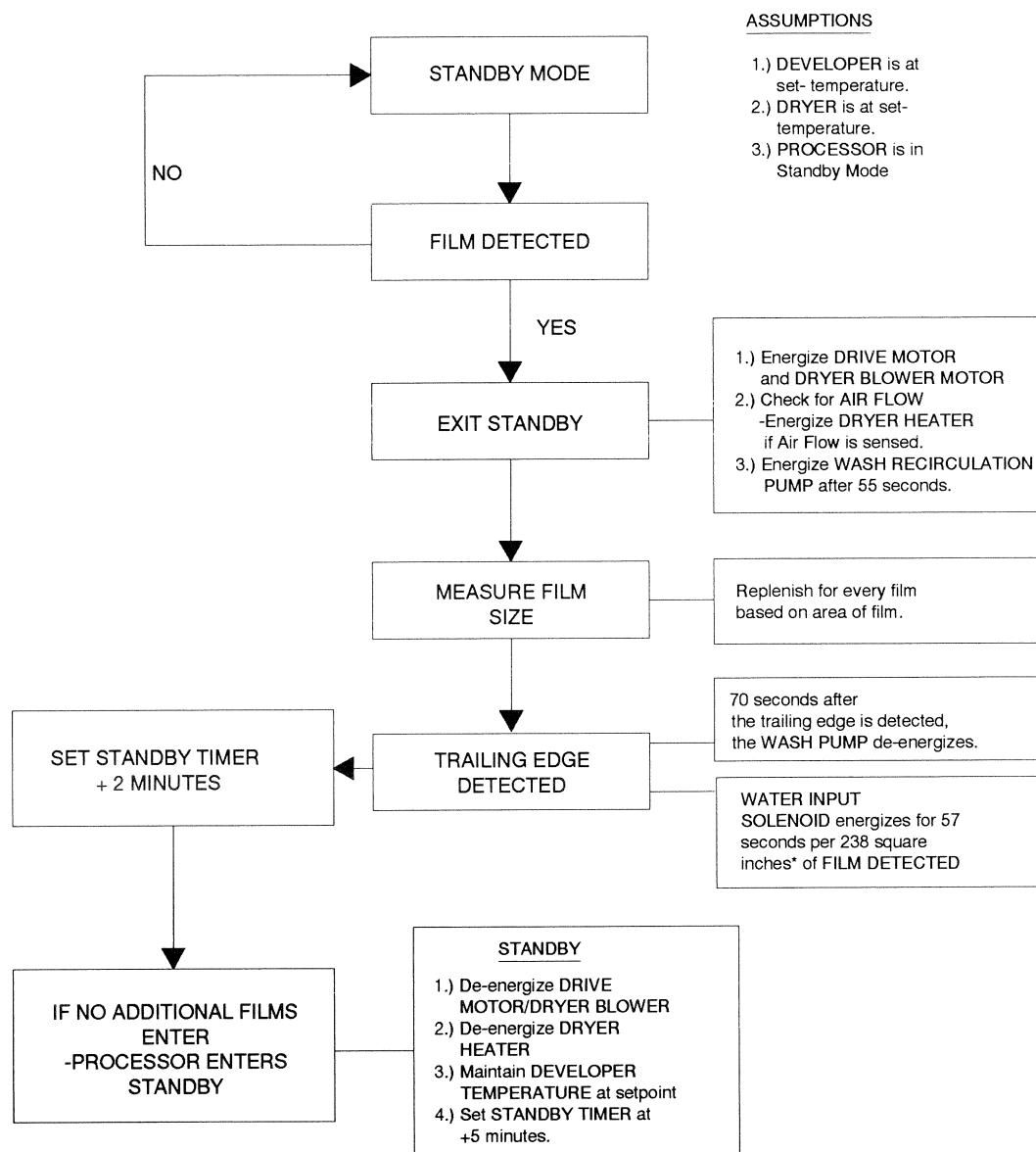
The diagram on page 28 describes how the processor operates in standby mode. Standby mode conserves both electricity and water and minimizes wear on moving parts since it leaves the main drive and other primary systems de-energized most of the time. The processor leaves the systems de-energized until the film sensors detect a sheet of film. When this occurs, the processor energizes the various systems. This cycle repeats every 5 minutes for 30 seconds unless the processor detects film being fed on the feed tray.

Maintaining Developer Temperature

The diagram on page 29 describes how the processor monitors a device called a thermistor. A thermistor reacts to changes in developer temperature, providing feedback that tells the microprocessor how long to leave the heating element on to raise the developer temperature. It also detects when the solution is too warm. This causes the heater in the developer solution to de-energize. After this occurs, water circulates through a heat exchanger in the developer tank to cool the developer solution.

Maintaining Dryer Temperature

The diagram on page 30 shows how feedback from a thermistor is used to control the length of time the dryer heater remains energized. A blower forces air across the heating coils of the dryer plenum. Here the heated air is directed through air tubes onto the film. This is done to remove any moisture remaining on the film after the film passes through the wash squeegee exit rollers.

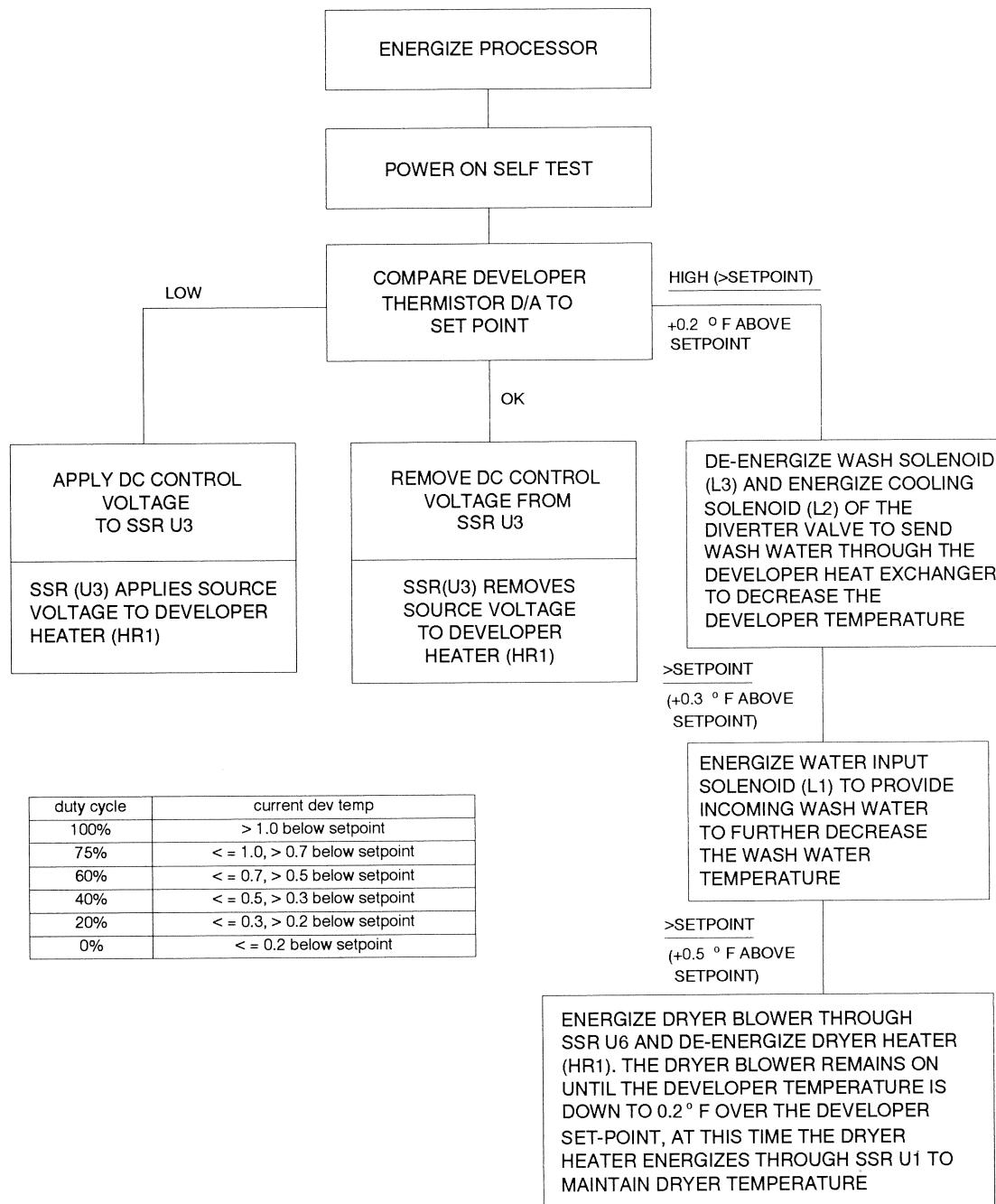


*SI units: 238sq in = 1535 cm²

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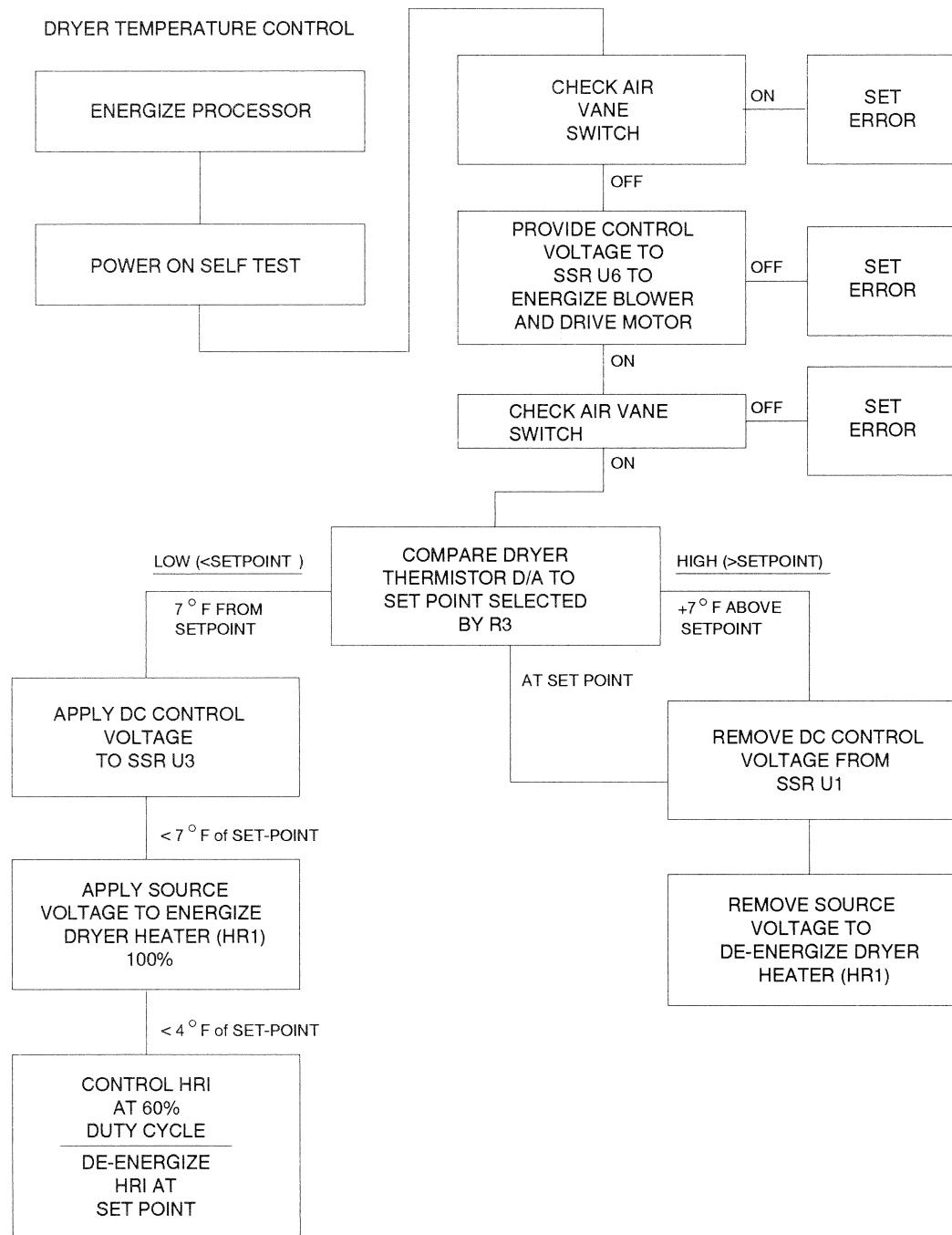
Figure 3 Sequence of Operation - Entering and Exiting Standby Mode

DEVELOPER TEMPERATURE CONTROL



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Figure 4 Sequence of Operation - Developer Temperature Control



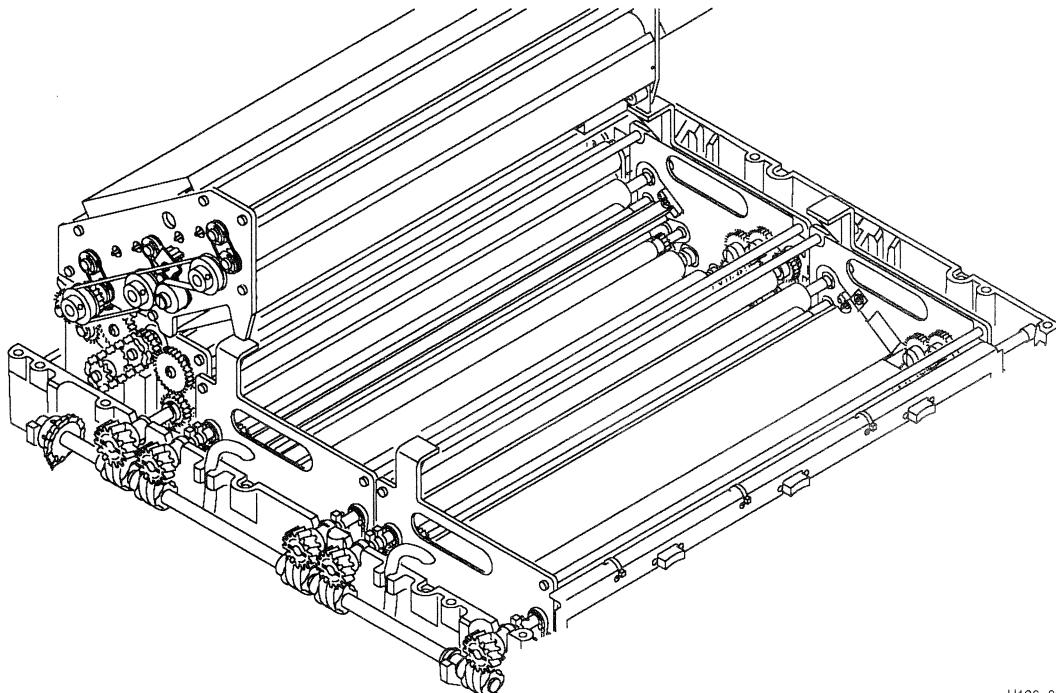
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Figure 5 Sequence of Operation - Dryer Temperature Control

Film Detection



In the Theory Guide, read the section “Detecting Film.” This section describes the sensors the processor uses to detect film. Then read the section “Film Approximation.” This section explains how the sensors are used to approximate film area for calculating replenishment volumes. Fill in the blanks with the appropriate information to help you study these sections.



**PRACTICE
EXERCISE****Fill-In Practice Exercise**

1. Three film _____ are at the feed tray to detect film as it enters the processor.
2. The Clinic 1 Processor determines film _____ and always assumes the width of the film to be 43.2 cm (17 in.).
3. In the M43 and M43A Processors, film _____ is estimated by the width of film determined by the number of sensors blocked multiplied by the length of time the sensors are blocked.
4. The sensors pulse _____ energy in order to prevent exposing panchromatic films.
5. Feed all films, except 10 x 10 cm (4 x 4 in.), against the _____ film guide of the feed tray.

**Fill-In Practice Exercise Answers**

1. Three film sensors are at the feed tray to detect film as it enters the processor.
2. The Clinic 1 Processor determines film length and always assumes the width of the film to be 43.2 cm (17 in.).
3. In the M43 and M43A Processors, film area is estimated by the width of the film determined by the number of sensors blocked multiplied by the length of time the sensors are blocked.
4. The sensors pulse infrared (IR) energy in order to prevent exposing panchromatic films.
5. Feed all films, except 10 x 10 cm (4 x 4 in.), against the left film guide of the feed tray.

Main Drive System



In the Theory Guide, read the section “Main Drive System.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

- When film is fed into the processor, the processor enters the operating mode.

The following actions occur while the processor is in the operating mode:

The main drive motor and the wash water pump _____.
The dryer blower and the dryer heater _____.

NOTE: In Clinic 1 Processor: the wash pump waits 55 seconds to energize. The wash pump energizes when film reaches the wash section. This keeps the processor from continually circulating cold wash water and excessively cooling the developer solution.

- The _____ operates the film transport.
- In M43A and Clinic 1 Processors, the main drive motor requires _____ V AC at _____ Hz.
- In the M43 Processor, the main drive motor requires _____ V AC at _____ Hz.
- A sprocket with _____ teeth is used for 50 Hz installations.
- The _____ on the main drive motor rotates the main drive shaft.
- The _____ on the drive shaft drive transport rollers and wash and dryer drive sections.

8. The main drive motor will operate even though the processor is NOT up to operating temperature. Therefore the operator should check the status of the _____ before feeding films.
9. The transport speed of the processor is _____ cm/min or _____ in./min.



Fill-In Practice Exercise Answers

1. When film is fed into the processor, the processor enters the operating mode. The following actions occur while the processor is in the operating mode:
The main drive motor and the wash water pump activate.
The dryer blower and the dryer heater energize.
2. The main drive motor operates the film transport.
3. In the M43A and Clinic 1 Processors, the main drive motor requires 115 V AC at 50/60 Hz.
4. In the M43 Processor, the main drive motor requires 230 V AC at 50/60 Hz.
5. A sprocket with 20 teeth is used for 50 Hz installations.
6. The drive chain on the main drive motor rotates the main drive shaft.
7. The worm gears on the drive shaft drive transport rollers and wash and dryer drive sections.
8. The main drive motor will operate even though the processor is NOT up to operating temperature. Therefore the operator should check the status of the display panel indicators before feeding films.
9. The transport speed of the processor is 60.96 cm/min or 24 in./min.

Processing



In the Theory Guide, read the section “Developer Section.” Fill in the blanks with the appropriate information to help you study this section.

Fill-In Practice Exercise

1. The _____ continually recirculates the developer solution.
2. The developer solution converts the _____ latent image on film to a visible image.
3. The film enters the developer rack through the _____.



Fill-In Practice Exercise Answers

1. The **recirculation pump** continually recirculates the developer solution.
2. The developer solution converts the **invisible** latent image on film to a visible image.
3. The film enters the developer rack through the **entrance rollers**.

Developer Temperature Control



In the Theory Guide, read the section “Controlling the Temperature of the Developer Solution.” This section includes the topics on the heating system, the cooling system, and the developer temperature display.



Fill-In Practice Exercise

Fill in the blank with the appropriate information to help you study this section.

1. M43 and M43A Processors display the _____ on the display panel.
2. The developer temperature control system is responsible for maintaining the temperature of the developer to within a few degrees of a specific temperature called the _____.
3. Developer temperature inversely changes the resistance of _____ in the developer tank.



Fill-In Practice Exercise Answers

1. M43 and M43A Processors display the **developer temperature** on the display panel.
2. The developer temperature control system is responsible for maintaining the temperature of the developer to within a few degrees of a specific temperature called the **set-point**.
3. Developer temperature inversely changes the resistance of **thermistor (RT1)** in the developer tank.

Developer Temperature Measurement/Control



In the Theory Guide, read the section “Developer Temperature Control.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

1. In the M43 and M43A Processors, 2 things normally occur to reduce developer solution temperature:

2. In the M43 and M43A Processors, the following occurs during the wash water cooling cycle:

3. The processor _____ water using recycled wash water rather than fresh tap water to cool developer solution.

4. The M43 and M43A Processors have a _____ in the fixer tank which the Clinic 1 Processor does not. This allows the M43 and M43A Processors to warm the fixer solution using heat absorbed by water flowing through the _____ in the developer tank.

Developer Temperature Measurement/Control (Continued)



Fill-In Practice Exercise Answers

1. In the M43 and M43A Processors, 2 things normally occur to reduce developer solution temperature:
The wash recirculation pump energizes.
The developer cooling diverter valve opens.
2. In the M43 and M43A Processors, the following occurs during the wash water cooling cycle:
Water is diverted to the heat exchanger in the developer tank.
Water flows through the heat exchanger in the fixer tank.
The wash water returns to the wash tank through the wash bars.
3. The processor conserves water using recycled wash water rather than fresh tap water to cool developer solution.
4. The M43 and M43A Processors have a heat exchanger in the fixer tank which the Clinic 1 Processor does not. This allows the M43 and M43A Processors to warm the fixer solution using heat absorbed by water flowing through the heat exchanger in the developer tank.

Fixer System



In the Theory Guide, read the section “Fixer Section.” Fill in the blanks with the appropriate information to help you study this section.

Fill-In Practice Exercise

1. Fixer solution removes unexposed _____ from the film.
2. With the top cover properly seated, the _____ turn on any time the main circuit breaker (CB1) is on.
3. The fixer heat exchanger is installed only in the _____ processors.
4. The _____ section does NOT contain a heater or thermistor.
5. The _____ recirculates fixer solution.



Fill-In Practice Exercise Answers

1. Fixer solution removes unexposed **silver halide crystals** from the Film.
2. With the top cover properly seated, the **developer and fixer recirculation pumps** turn on any time the main circuit breaker (CB1) is on.
3. The fixer heat exchanger is installed only in the **M43 and M43A** Processors.
4. The **fixer** section does NOT contain a heater or thermistor.
5. The **recirculation pump** recirculates fixer solution.

Wash System



In the Theory Guide, read the section “Wash Section.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

1. Wash water rinses excess _____ from the film.
2. Proper washing prevents the _____ of the image over time.
3. The wash pump is _____ during the standby mode.
4. Wash water _____ occurs when films are sensed by the film sensors.
5. The wash rack contains a set of entrance rollers and a set of _____ rollers.



Fill-In Practice Exercise Answers

1. Wash water rinses excess **developer and fixer solution** from the film.
2. Proper washing prevents the **deterioration** of the image over time.
3. The wash pump is **de-energized** during the standby mode.
4. Wash water **replenishment** occurs when films are sensed by the film sensors.
5. The wash rack contains a set of entrance rollers and a set of **exit squeegee** rollers.

Wash Water Control



In the Theory Guide, read the section “Wash Water Control.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

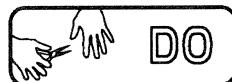
1. The processor takes approximately _____ to fill the wash tank.
2. The wash pump does not energize until 40 seconds after the processor energizes. This is done to ensure that _____.



Fill-In Practice Exercise Answers

1. The processor takes approximately 8 minutes to fill the wash tank.
2. The wash pump does not energize until 40 seconds after the processor energizes. This is done to ensure that there is water available to pump.

Dryer System



In the Service Manual, read the section “Removing the Dryer Thermistor (RT2), Air Vane Switch (S4), Dryer Heater (HR2), and Dryer Blower Motor (B1).” Review the figures showing the step by step removal of all the parts. Follow the locator lines on the figure titled “Disconnecting the Dryer Components.” This will help you remember the location and the orientation of the dryer components.



In the Theory Guide, read the section “Drying Section.”

Dryer Temperature Control



In the Theory Guide, read the section “Regulating the Temperature of the Dryer.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

1. Under normal conditions, dryer temperature control maintains dryer temperature within approximately _____ the set-point temperature.
2. The dryer set-point temperature is adjusted by _____ on the _____.
3. There are _____ possible set-point temperature dial positions called detents for the dryer temperature potentiometer.
4. According to the dryer circuit diagram, _____ is the relay that controls the dryer heater coils.



Fill-In Practice Exercise Answers

1. Under normal conditions, dryer temperature control maintains dryer temperature within approximately 5°F above or below the set-point temperature.
2. The dryer set-point temperature is adjusted by rotating potentiometer (R3) on the front display panel.
3. There are 11 possible set-point temperature dial positions called detents for the dryer temperature potentiometer.
4. According to the dryer circuit diagram, SSR U1 is the relay that controls the dryer heater coils.

Replenishment



In the Theory Guide, read the section “Replenishment of the Developer and Fixer Processing Solutions.”

Key Points to Remember

- The processor automatically replenishes developer and fixer solutions to maintain proper chemical activity.
- Film size dictates the amount of replenishment added.
- Replenishment is based on 14 x 17 inch area of Film - 238 sq. in.

Standby Mode



In the Theory Guide, read the section “Standby Mode.” Fill in the blanks with the appropriate information to help you study this section.

**PRACTICE
EXERCISE****Fill-In Practice Exercise**

1. The processor enters standby mode _____ after the film's trailing edge is sensed, if _____.
_____.
2. The processor exits standby mode and enters run mode if
_____.
3. In standby mode the following actions take place:
 - Wash pump _____
 - Developer temperature is maintained at _____
 - Dryer heater, dryer blower and the main drive motor

4. After 5 minutes in standby mode the dryer heater, dryer blower, and main drive motor are _____ until the dryer reaches
_____ temperature.

**Fill-In Practice Exercise Answers**

1. The processor enters standby mode **2 minutes** after the film's trailing edge is sensed, if **no new film is detected**.
2. The processor exits standby mode and enters run mode if **film is detected**.
3. In Standby Mode the following actions take place:
 - Wash pump **is off (de-energized)**
 - Developer temperature is maintained at **set-point temperature**
 - Dryer heater, dryer blower and the main drive motor
de-energize
4. After 5 minutes in standby mode the dryer heater, dryer blower, and main drive motor are **energized** until the dryer reaches **set-point** temperature.

Self Evaluation

Answer the following multiple choice questions to evaluate your understanding of the PRODUCT OVERVIEW module.

Note:

- Check the **answer key** for the correct answers.
- You should answer at least **17 out of 21** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 2 again if you answered more than 4 questions incorrectly.

Multiple Choice Test

Module 2 Course Evaluation

See the answer key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. What is the difference between the M43 and M43A Processors?
 - a. Tank Capacity
 - b. Power Requirements
 - c. Processing Time
 - d. Features and Benefits
2. How does the Clinic 1 Processor differ from the M43A Processor?
 - a. Tank Capacity
 - b. Power Requirements
 - c. Processing Time
 - d. Features and Benefits
3. Which features do the M43 and M43A Processors have that are not available on the Clinic 1 Processor?
 - a. developer temperature display, heat exchanger in the developer tank and built in error indication and service routines,
 - b. heat exchanger in the fixer tank and a film-in to film-out processing time of 127 seconds,
 - c. wash diverter valve and replenishment based on measured film area,
 - d. fast feed tray clearance time (35 seconds) and film load and exit from the front of the unit,

4. The developer system _____.
- converts the invisible latent image on the film to a visible image
 - circulates heated air across the film surfaces
 - removes excess chemical solutions from both sides of the film
 - stops the continued development of the visible image by removing unexposed silver halide crystals on the film
5. The film exits from the developer rack and enters the _____.
- feed tray
 - wash system
 - fixer rack
 - dryer
6. The fixer section of the processor does not contain a _____; therefore, the fixer solution temperature is not monitored.
- film sensor or potentiometer
 - heater or thermistor
 - microprocessor board
 - replenishment pump
7. The developer temperature determines the wash water path in the M43 and M43A Processors.
- True
 - False
8. In standby mode, the dryer heater and dryer blower are normally energized, but will de-energize from time to time to keep the dryer's ambient temperature close to the set-point.
- True
 - False

9. The processor automatically replenishes _____.
 - a. developer solution only
 - b. fixer solution only
 - c. developer and fixer solution only
 - d. developer and fixer solution and wash water
10. The Clinic 1 Processor uses a heat exchanger in the fixer tank to help control the fixer solution temperature.
 - a. True
 - b. False
11. The developer set-point temperature is adjusted by rotating potentiometer R25 on the 100 Board.
 - a. True
 - b. False
12. Film length is determined by the length of time one or more of the film sensors is blocked.
 - a. True
 - b. False
13. A sprocket with _____ teeth is used for 50 Hz operation.
 - a. 16
 - b. 20
14. Four sensors detect film as it enters the processor.
 - a. True
 - b. False
15. Which of these does not occur when the processor exits standby mode and enters operating mode.
 - a. The main drive motor energizes.
 - b. The wash water pump energizes, providing water to the wash rack.
 - c. The film sensors are de-energized to prevent infrared energy from fogging the film.
 - d. The dryer blower and dryer heater energize.

16. Dryer air vane switch S4 senses dryer air temperature changes when resistance variations develop across its terminals.
 - a. True
 - b. False
17. The AC safety interlock switch S5 _____.
 - a. is located on the drive side of the processor
 - b. prevents the processor from operating while the top cover is off the processor
 - c. is located near the dryer rack
 - d. All of the above are correct
18. Temperature changes in the developer solution affect the resistance of developer thermistor RT1.
 - a. True
 - b. False
19. The fixer system _____.
 - a. converts the invisible latent image on the film to a visible image
 - b. circulates heated air across the film surfaces
 - c. removes excess chemical solutions from both sides of the film
 - d. stops the continued development of the visible image by removing unexposed silver halide crystals on the film
20. Which processor model would you recommend to a low-film-usage veterinary clinic?
 - a. M43
 - b. M43A
 - c. Clinic 1
21. It is not recommended to install a Clinic 1 Processor in a main radiology department of a hospital.
 - a. True
 - b. False

Multiple Choice Test - Answer Key

Check your answers to the Module 2 Course Evaluation. Review Module 2 again if you did not answer 17 out of 21 questions correctly.

Module 2 Course Evaluation Answers

- (1) b. Power Requirements
- (2) d. Features and Benefits
- (3) c. wash diverter valve and replenishment based on measured film area,
- (4) a. converts the invisible latent image on the film to a visible image.
- (5) c. fixer rack
- (6) b. heater or thermistor
- (7) a. True
- (8) b. False
- (9) d. Developer and fixer solution and wash water
- (10) b. False
- (11) a. True
- (12) a. True
- (13) b. 20
- (14) b. False
- (15) c. The film sensors are de-energized to prevent IR energy from fogging the film.
- (16) b. False
- (17) d. All of the above are correct.
- (18) a. True
- (19) d. stops the continued development of the visible image by removing unused silver halide crystals on the film
- (20) c. Clinic 1
- (21) a. True

SITE SPECIFICATION and INSTALLATION

Objectives

After completion of this training module, students will be able to:

- Locate information necessary to plan and administer the installation of a processor.
- Locate information relevant to planning the site specifications.
- Identify and explain the 3 customer setup options for configuring the processor.
- Identify accessories.
- Locate information on how to install, operate, and test the processor.

Site Specification Installation Planning

The following checklist contains a sampling of the questions that should be answered before scheduling an installation. These questions address specific site requirements necessary for successfully installing an M43/M43A or Clinic 1 Processor. This is not a formal checklist that must be presented to every possible customer. It is intended as a summary of the types of questions sales representatives would ask a customer to plan an efficient installation.

Questions for the Customer Concerning Installation

- What are the line voltage readings for the area where the processor will be installed?
- Do you have a dedicated line for the electrical connection of the processor?
- Can the electric power switch be seen from the service area around the processor?
- Will an electrician be available to prepare for proper connection of the processor?
- Where is the air vent for supplying the processor room with refreshed air?
- Have you ever experienced earth tremors or quakes at this installation site?
- Is there a possibility of earth tremors or quakes occurring in the future at this site?
- What is the size of the available work area for unpacking the processor?
- Where would you like to place the processor?
- Is a processor mounting stand preferred or required?
- Will the site require a through-the-wall installation?
- If the processor is to operate through-the-wall, can the electric power switch be located outside the darkroom?
- Are there any hidden obstructions in the location you plan on using to install the processor through-the-wall?
- What size replenishment tanks will be used?
- Where will the replenishment tanks be located? In the darkroom or out of the darkroom?
- Will a contractor be available to prepare the hole in the wall?
- What are the local codes for service and input hoses?
- Where is the drain that will be used?
- Is the exhaust system vented to the outside of the building?
- What is the water pressure and temperature of your water supply?
- What is the local code for your water supply?
- What is the local code for drainage?
- What is the local code for silver recovery?

Questions for the Operator Concerning Customer Setup Options

- How many films do you anticipate processing daily?
- Do you prefer seeing Fahrenheit or Celsius temperature readings? (M43 and M43A only)
- What is the typical quantity of films processed back to back? Should the flooded mode be selected?

Questions for You Concerning Installation

- Does the room air supply turn over 10 times every hour of every day?
- What is the negative static air flow reading at the exhaust duct?
- What are the dimensions of the doorways the processor passes through to arrive at the installation site?
- What are the dimensions of the area where the processor is to be placed?
- Does the Floor Template fit the area and allow for serviceability space?
- What are the dimensions of the table or counter where the processor will be located?
- Will the table or counter be able to support the 114 kg (250 lb) processor?
- Are all of the maintenance and operational access requirements acceptable?
- Does the maximum length of the replenishment tube exceed 7.6 m (25 ft)?
- Does the service and input hose comply with local codes?
- Is there sufficient area for the replenishment tanks?
- Is the main power disconnect a safe distance for the water service, but within sight of the processor?
- Are the room temperature and humidity within acceptable ranges?
- Is a water chiller required?
- What is the capacity of the drain?
- What size is the connection to the drain?
- Is the drain made of chemically resistant, non-corrosive materials: e.g. PVC?
- Will the drain tubing continually slope downward to the floor drain?
- Is a check valve necessary for the processor water supply?
- Does the built-in 2 in. air gap satisfy the local codes?
- Are the water temperature and pressure within acceptable ranges?

Accessories



In the Site Specifications, read the section “Optional Accessory and Kits” and study the information describing the Accessory Kits. The Seismic Anchor Bracket Kit is required for areas where local codes mandate this type of protection. Fill in the blanks with the appropriate information to help you study this section.

Kits and Accessories available include:

- Processor mounting stand
- Lighttight feed tray
- Vent duct adapter kit
- Auxiliary ventilation fan kit
- Transformer kits
- Seismic anchor bracket kit
- Installation Kit
- Through-the-Wall Kit

NOTE: The installation instructions for the lighttight feed tray, the vent duct adapter kit, the transformer kits and the seismic anchor bracket kit are packed with the accessories.



Fill-In Practice Exercise

1. The processor mounting stand has pre-drilled holes for plumbing connections and _____.
2. The vent duct adapter kit is used with the _____ if the site does not meet the recommended 10 air exchanges/hour.
3. You adjust the clearance between the building vent duct and the duct from the processor to obtain the required _____.
4. The _____ ensures the operational voltage range of 115 V AC sites.
5. Check your _____ to see if use of the seismic kit is required.

6. The Installation Kit Cat No. 8632754 provides all of the components necessary to install the _____ model processor.
7. The _____ kit assumes the use of the *Kodak* M35, M43, Clinic 1 Mounting Stand.



Fill-In Practice Exercise Answers

1. The processor mounting stand has pre-drilled holes for plumbing connections and processor mounting.
2. The vent duct adapter kit is used with the *Kodak Auxiliary Ventilation Fan* if the site does not meet the recommended 10 air exchanges/hour.
3. You adjust the clearance between the building vent duct and the duct from the processor to obtain the required negative static pressure.
4. The transformer kit ensures the operational voltage range of 115 V AC sites.
5. Check your local codes to see if use of the seismic kit is required.
6. The Installation Kit Cat No. 8632754 provides all of the components necessary to install the Clinic 1 model processor.
7. The Through-the-Wall kit assumes the use of the *Kodak* M35, M43, Clinic 1 Mounting Stand.

Processor Setup Options



In the Operator Manual, read the section “Processor Setup Options.” Next, read the “Processor Setup Options” section in the Installation Instructions. This section describes the 3 optional customer setup configurations and also explains how to change the setup options by changing jumpers on the 100 circuit board. Fill in the blanks with the appropriate information to help you study these topics.

PRACTICE
EXERCISE

Fill-In Practice Exercise

1. The 3 optional configurations for M43 and M43A Processors are:

2. Flooded replenishment mode is intended for sites processing low film volumes of less than _____ films per 8 hour period.
3. Most installations operate in the _____ mode in order to conserve energy and save wear on the parts.
4. A site having high film usage is a good candidate to operate the processor in the _____.
5. A processor set up for flooded replenishment, pumps additional _____ every 25 minutes.



Fill-In Practice Exercise Answers

1. The 3 optional configurations for M43 and M43A Processors are:
Celsius or Fahrenheit Developer Temperature Display
Normal or Flooded Replenishment
Standby Mode or Continuous Mode
2. Flooded replenishment mode is intended for sites processing low film volumes of less than **20** films per 8 hour period.
3. Most installations operate in the **standby** mode in order to conserve energy and save wear on the parts.
4. A site having high film usage is a good candidate to operate the processor in the **continuous mode**.
5. A processor set up for flooded replenishment, pumps additional **replenishment chemicals** every 25 minutes.

Room Layout/Proper Service Space



In the Site Specifications manual, study the procedures in the section “Room Layouts.”

Items to Note

While planning a site layout using the Site Specifications, pay attention to the following items:

- 91.4 cm (36 in.) is the minimum recommended service clearance around the processor. This provides space for the service person to access processor assemblies and parts during service.
- Proper drainage is essential. (Check local codes.)
- If you must place the processor against the wall, be certain that the non-drive side and/or the back side of the processor is to the wall.

Electrical Requirements



In the Site Specifications, study the information contained in the section “Electrical Requirements.”

While planning a site’s electrical requirements using the Site Specifications, pay attention to the following items:

- The service options table specifies the voltage range for operation without the transformer kit.
- A dedicated circuit provides electrical isolation for the safe operation of the processor.
- Single phase voltage requirement means most sites will not require additional electrical service.

Environmental, Water, and Drain Requirements



In the Site Specifications, read the section “Environmental Requirements.” Next, read the section “Water and Drain Requirements.”

While studying the **Environmental Requirements**, pay attention to the following items:

- If the heat load (thermal energy) to the room exceeds the cooling capacity of the room, the ambient temperature could exceed the recommended range.
- The caution about room air changes emphasizes that the building’s exhaust system must force air to the outside of the building. Optional accessories for venting air are available if required.

While studying the **Water and Drain Requirements**, pay attention to the following items:

- The water temperature should be 5.6°C (8°F) below the developer set-point temperature.
- Make sure that the drain is made of CPVC, PVC, or equivalent.
- A 50-micron filter is recommended. This filter keeps particles out of the wash water that could damage the rollers or wash tubes.

Free Standing vs. Through-the-Wall Installation



In the Installation Instruction manual, read the section “Installing the Processor on a Table Top.” When you finish reading that section, read the section “Installing the Processor Through the Wall.”

While studying these procedures, pay attention to the following items:

- When installing the processor on a table top you install the leveling feet. However, you do not level the processor until later in the installation.
- The through-the-wall procedure asks you to check on the location of the floor drain, the replenishment tanks, the main water supply and main power. Follow the recommendations in the installation procedure for their location relative to the darkroom when installing the processor through the wall.

Changing to 50/60 Hz Operation



In the Installation Instructions, read the section “Changing the Processor to 50/60 Hz Operation.”

While studying the procedure, pay attention to the following items:

- All 115 V AC processors are set up for 60 Hz operation.
- All 230 V AC processors are set up for 50 Hz operation.

Leveling



In the Installation Instructions, read the section “Leveling the Processor.”

While studying the procedure, pay attention to the following items:

- Establish the final location for the processor before leveling it.
- Leveling the processor ensures correct flow of solutions and proper transport of film.
- Be sure to level the processor both front-to-back and side-to-side.

Electrical Connections



In the Installation Instructions, study the procedures in the section “Making the Necessary Connections.”

While studying the procedure, pay attention to the following items:

- A cable without a plug is provided for the M43A Processor only.
- All electrical connections to the building electrical supply must conform to local codes.

Water Leak Test



In the Installation Instructions manual, read the section “Doing the Water Leak Test.”

While studying the procedure, pay attention to the following items:

- It is important that all 3 drain valves are closed before beginning the procedure.
- The reasons for performing the test with water are outlined below:
 - If a leak develops the service person can repair it without having to drain developer or fixer solution.
 - A processor with no leaks ensures the safety of the operator and prevents possible damage to the equipment.
 - The water test provides additional verification that the processor is level.
 - Water recirculating through the racks cleans any debris in the tanks or the racks.
 - Water can be used for the developer temperature check and the replenishment rates check.

Checking and Adjusting Replenishment Rates



In the Installation Instructions, read the section “Checking and Adjusting the Replenishment Rates.” Fill in the blanks in the Practice Exercise to help you study this material.



Fill-In Practice Exercise

1. The replenishment pumps are preset by the factory to pump _____ volumes of developer and fixer replenishment solutions.
2. The replenishment rate for the fixer is _____ % greater than the replenishment rate for the developer.
3. In the replenishment check mode, block the _____ to request replenishment for the developer and fixer solutions.
4. Divide the volume of developer replenishment in the graduated cylinder by _____ to arrive at the average measurement.
5. If you measure less than the recommended volume of development replenishment solution, insert and remove a small sheet of film under the _____ to increase the replenishment rate by 5 ml.
6. To enter the replenishment check mode, the processor must be _____ and the top cover must be _____.



Fill-In Practice Exercise Answers

1. The replenishment pumps are preset by the factory to pump **proportional** volumes of developer and fixer replenishment solutions.
2. The replenishment rate for the fixer is **15 to 20%** greater than the replenishment rate for the developer.
3. In the replenishment check mode, block the **middle film sensor** to request replenishment for the developer and fixer solutions.
4. Divide the volume of developer replenishment in the graduated cylinder by **3** to arrive at the average measurement.
5. If you measure less than the recommended volume of development replenishment solution, insert and remove a small sheet of film under the **right (plus) film sensor** to increase the replenishment rate by 5 ml.
6. To enter the replenishment check mode, the processor must be **energized** and the top cover must be **removed**.

Final Checkout



In the Installation Instructions, turn to the information under the heading “Final Checkout” and read its contents. Fill in the blanks with the appropriate information to help you study this section.

**PRACTICE
EXERCISE****Fill-In Practice Exercise**

1. The transport test checks that a sheet of film exits the dryer assembly within _____ from the time you fed the film into the processor.
2. Films should be cool and _____ when they exit the dryer assembly.
3. The dryer set-point temperature is too high if the films feel _____ when they exit the dryer assembly.
4. Single-emulsion films may require a slightly _____ dryer set-point temperature than double-emulsion films.

**Fill-In Practice Exercise Answers**

1. The transport test checks that a sheet of film exits the dryer assembly within 2 minutes and 8 seconds from the time you fed the film into the processor.
2. Films should be cool and "just dry" when they exit the dryer assembly.
3. The dryer set-point temperature is too high if the films feel hot to the touch when they exit the dryer assembly.
4. Single-emulsion films may require a slightly higher dryer set-point temperature than double-emulsion films.

Self Evaluation

Answer the following multiple choice questions to evaluate your understanding of the PRODUCT OVERVIEW module.

Note:

- Check the **answer key** for the correct answers.
- You should answer at least **8 out of 10** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 3 again if you answered more than 2 questions incorrectly.

Multiple Choice Test

Module 3 Course Evaluation

See the answer key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. The uncrated width of the processor is _____.
 - a. 30.5 cm (12 in.)
 - b. 98.4 cm (38 $\frac{3}{4}$ in.)
 - c. 72.4 cm (28 $\frac{1}{2}$ in.)
 - d. 52.7 cm (20 $\frac{3}{4}$ in.)
2. Maintenance access for the processor on all 4 sides and the top is _____.
 - a. 7.6 cm (3 in.)
 - b. 91.4 cm (36 in.)
 - c. twice the width on the 4 sides and 91.4 cm (36 in.) on top
 - d. 45.7 cm (18 in.)
3. The site should be able to meet the requirement for _____ air exchanges per hour.
 - a. 5
 - b. 15
 - c. 20
 - d. 10

4. The processor is factory set to the _____ replenishment mode.
- normal
 - flooded
 - standby
 - continuous
5. Jumper _____ is left in its factory position on the 100 circuit board to display the developer temperature in _____ units.
- E1 Fahrenheit
 - E2 Fahrenheit
 - E2 Celsius
 - E1 Celsius
6. You block the _____ film sensor to request replenishment for the developer solution when doing the procedure to check and adjust the replenishment rates.
- left (-)
 - middle
 - right (+)
 - left (-) than the right (-)
7. Any time you adjust the replenishment rate, you are _____ .
- adjusting the replenishment volume for the developer only
 - adjusting the replenishment volume for the fixer only
 - adjusting the replenishment volume for both developer and fixer
 - changing the proportion of developer to fixer replenishment

8. The air meter (TL-2431) is used to read negative static pressure in the exhaust duct from the end that is to be connected to the processor. In this context the word negative describes an air flow that is heading

-
- a. away from the processor and out of the building
 - b. away from the processor and into the building
 - c. toward the processor and into the building
 - d. toward the processor and out of the building

9. According to the Site Specifications, the water shutoff valve is

-
- a. not provided
 - b. provided only for M43/M43A Processors
 - c. provided only for the Clinic 1 Processor
 - d. optional

10. In the transport test, the time a sheet is fed until it exits should be within

-
- a. 2 minutes and 50 seconds
 - b. 2 minutes and 8 seconds
 - c. 3 minutes and 8 seconds
 - d. 1 minute and 8 seconds

Multiple Choice Test - Answer Key

Check your answers to the Module 3 Course Evaluation. Review Module 3 again if you did not answer 8 out of 10 questions correctly.

Module 3 Course Evaluation Answers

- (1) c. 72.4 cm (28½ in.)
- (2) b. 91.4 cm (36 in.)
- (3) d. 10
- (4) a. normal
- (5) c. E2 Celsius
- (6) b. middle
- (7) c. adjusting the replenishment volume for both developer and fixer
- (8) a. away from the processor and out of the building
- (9) a. not provided.
- (10) b. 2 minutes and 8 seconds

OPERATION

Objectives

After completion of this training module, students will be able to:

- List 2 key steps to follow when mixing processor chemistry.
- Describe proper operation of the processor.
- Describe processor adjustments.
- Locate and follow instructions related to preventive maintenance (PM) on the processor.
- Locate instructions explaining blink patterns on the display panel.
- Identify error conditions and appropriate corrective actions.
- Interpret and explain the diagnosing mechanical problems chart.

Mixing Chemicals



In the Operator Manual, read the section “Mixing the Chemicals.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

1. Follow all _____ and _____ on the labels and instruction sheets that are packed with the fixer and developer containers when mixing chemical solutions.
2. Wear _____, and _____, and _____ when handling chemical solutions.
3. Mix only a _____ supply of developer replenishment but at least _____.



Fill-In Practice Exercise Answers

1. Follow all **instructions** and **precautions** on the labels and instruction sheets that are packed with the fixer and developer containers when mixing chemical solutions.
2. Wear **rubber gloves**, **safety glasses**, and **protective clothing** when handling chemical solutions.
3. Mix only a **2-week** supply of developer replenishment but at least **19 litres (5 gallons)**.

Filling and Draining Tanks



In the Operator Manual, read the sections “Draining the Processor Tanks,” “Filling the Fixer Tank,” and “Filling the Developer Tank.” Fill in the blanks with the appropriate information to help you study these sections.

PRACTICE EXERCISE

Fill-In Practice Exercise

1. Always check to verify the _____ are _____ before adding fresh chemistry.
2. Check _____ before draining solutions into a _____.
3. To avoid flooding the silver recovery unit, disconnect the _____ from the _____ of the silver recovery unit before opening the _____.
4. The operator should drain fixer solution into a _____ or if permitted, _____.
5. Small amounts of _____ can seriously contaminate the _____.

6. To avoid contamination, fill the _____ tank first so that any _____ solution spilled into the _____ tank can be thoroughly cleaned before adding _____ solution.
7. The _____ should be used to avoid fixer spills and splashes from getting in the _____ solution.

**CHECK**

Fill-In Practice Exercise Answers

1. Always check to verify the drain valves are closed before adding fresh chemistry.
2. Check local codes before draining solutions into a floor drain.
3. To avoid flooding the silver recovery unit, disconnect the fixer drain tube from the input side of the silver recovery unit before opening the drain valve.
4. The operator should drain fixer solution into a container or if permitted, directly into the floor drain.
5. Small amounts of fixer solution can seriously contaminate the developer solution.
6. To avoid contamination, fill the fixer tank first so that any fixer solution spilled into the developer tank can be thoroughly cleaned before adding developer solution.
7. The splash guard should be used to avoid fixer spills and splashes from getting in the developer solution.

Start Up/Shut Down



In the Operator Manual, read the sections “Daily Start-Up” and “Shutdown.” Fill in the blanks with the appropriate information to help you study this section.



Fill-In Practice Exercise

Start-Up

1. Energize the processor by moving the on/off switch to the _____ position.
2. Allow the processor _____ to warm up under average site conditions.
3. Allow up to _____ under extreme low temperature conditions.
4. When the _____ indicator illuminates and the _____ indicator turns off, verify correct roller transport and operation of the processor by feeding a _____ film, or a _____ film.

Shutdown

1. De-energize the processor by moving the on/off switch to the _____ position.
2. Turn off the _____ and _____.
3. Open the _____ drain valve.
4. Do the _____ cleanup procedures.



Fill-In Practice Exercise Answers

Start-Up

1. Energize the processor by moving the on/off switch to the "I" position.
2. Allow the processor 10 to 20 minutes to warm up under average site conditions.
3. Allow up to 45 minutes under extreme low temperature conditions.
4. When the "ready" indicator illuminates and the "wait" indicator turns off, verify correct roller transport and operation of the processor by feeding a test sheet of pre-exposed, non-processed film, or a new sheet of clean-up film.

Shutdown

1. De-energize the processor by moving the on/off switch to the "O" position.
2. Turn off the main power and water supply.
3. Open the wash drain valve.
4. Do the daily cleanup procedures.

Operating Display Panel



In the Operator Manual, locate the figure titled “Identifying the Status Indicator Lights.”

Indicators that illuminate for display purposes include the:

- 3 LED Status Indicators (Ready, Wait, and Service)
- Developer Temperature Display (M43 and M43A Processors only)



In the Operator Manual, read the section “Operating Notes” and the study the table titled “Indicator Blink Patterns.” After reading through the material, fill in the blanks with the appropriate information to help you study this section.

PRACTICE EXERCISE

Fill-In Practice Exercise

1. When the Ready indicator illuminates and neither the Wait or Service indicator is illuminated or blinking, it indicates that:

2. When the Ready indicator illuminates and the Wait indicator blinks 3 times, it indicates that:

3. It is suggested NOT to feed film when any one or combination of these 3 occurs:

“Ready” = _____

“Wait” = _____

“Service” = _____

4. Film may exit wet when this combination of 3 indicator blink patterns occurs:

“Ready” = _____

“Wait” = _____

“Service” = _____



Fill-In Practice Exercise Answers

1. When the Ready indicator illuminates and neither the Wait or Service indicator is illuminated or blinking, it indicates that:

Developer is at the correct temperature.

Dryer is at set-point temperature.

The processor is ready for film-feed.

2. When the Ready indicator illuminates and the Wait indicator blinks 3 times, it indicates that:

Developer is at the correct temperature.

Dryer is NOT at set-point temperature.

Emergency films may be run, but may exit wet or damp.

3. It is suggested NOT to feed film when any one or combination of these 3 occurs:

“Ready” = Off

“Wait” = Blink or Off

“Service” = Blink or Off

4. Film may exit wet when this combination of 3 indicator blink patterns occurs:

“Ready” = On

“Wait” = Blinks 3 times

“Service” = Off

Dryer Temperature Adjustment



In the Operator Manual, read the section “Adjusting the Dryer Temperature.” Fill in the blanks with the appropriate information to help you study this section.



Fill In Practice Exercise

1. If Films exit damp and feel tacky, then the dryer _____ is too _____; to compensate turn the dryer temperature control knob _____ one detent.
2. If films exit over dry and feel hot, then dryer _____ is too _____; to compensate turn the dryer temperature control knob _____ one detent.
3. Wait _____ minutes between temperature adjustments so the dryer can reach the new set-point temperature.



Fill-In Practice Exercise Answers

1. If films exit damp and feel tacky, then dryer **set-point temperature** is too **low**; to compensate turn the dryer temperature control knob **clockwise** one detent.
2. If films exit over dry and feel hot, then dryer **set-point temperature** is too **high**; to compensate turn the dryer temperature control knob **counterclockwise** one detent.
3. Wait **5** minutes between temperature adjustments so the dryer can reach the new set-point temperature.

Film Feeding



In the Operator Manual, read the section “Film Feeding Procedure” and study the figure titled “Recommended Feeding of X-Ray Film Sizes.” Fill in the blanks with the appropriate information to help you study these sections.



Fill In Practice Exercise

1. To prevent artifacts that are caused when developer solution wets rollers, sensors, and the feed tray, do NOT _____ films after feeding them into the processor.
2. Feed 10x 10 cm (4 x 4 in.) sheets of film sheets square with the _____ edge of the film guide since the right sensor is the only one positioned to see this size film.
3. Feed all other size film sheets square with the _____ edge of the film guide for optimum replenishment.



Fill In Practice Exercise Answers

1. To prevent artifacts that are caused when developer solution wets rollers, sensors, and the feed tray, do NOT **pull back** films after feeding them into the processor.
2. Feed 10 x 10 cm (4 x 4 in.) sheets of film square with the **right** edge of the film guide since the right sensor is the only one positioned to see this size film.
3. Feed all other size film sheets square with the **left** edge of the film guide for optimum replenishment.

Preventive Maintenance



In the Operator Manual, study the procedures in the section "Preventive Maintenance." Fill in the blanks with the appropriate information to help you study these topics.

PRACTICE EXERCISE

Fill In Practice Exercise

1. During daily clean-up, do NOT use a _____ to clean any processor parts. Instead, use _____ and a clean, damp, _____.
2. Wear _____, _____, and _____ when performing maintenance on the processor.
3. Daily clean-up consists of wiping the _____, _____, and _____ using warm water and a clean, damp, lint-free cloth.
4. During weekly preventive maintenance you should clean the evaporation covers and _____ with warm water and a clean, damp, lint-free cloth.
5. During 3 months preventive maintenance you verify that all rollers on the racks rotate freely and are _____ and _____.
6. To prevent contamination, do NOT use the _____ to clean the _____ and the _____.
7. Be sure to install or remove racks slowly to avoid _____ thus preventing _____ of processing solutions.

8. A qualified service provider performs periodic maintenance procedures every _____ months or as _____
9. Do NOT immerse racks in system cleaner because some of the _____ are hollow and will retain solution.
10. System cleaner that remains in the _____ will contaminate the processing solutions.



Fill In Practice Exercise Answers

1. During daily clean-up, do NOT use a sponge to clean any processor parts. Instead, use warm water and a clean damp, lint-free cloth.
2. Wear rubber gloves, safety glasses, and protective clothing when performing maintenance on the processor.
3. Daily clean-up consists of wiping the feed tray, top cover, and access panels using warm water and a clean, damp, lint-free cloth.
4. During weekly preventive maintenance you should clean the evaporation covers and all the racks with warm water and a clean, damp, lint-free cloth.
5. During 3 months preventive maintenance you verify that all rollers on the racks rotate freely and are clean and smooth.
6. To prevent contamination, do NOT use the same cloth to clean the fixer tank and developer tank.
7. Be sure to install or remove racks slowly to avoid splashing, thus preventing contamination of processing solutions.
8. A qualified service provider performs periodic maintenance procedures every 6 months or as experience indicates.
9. Do NOT immerse racks in system cleaner because some of the rollers are hollow and will retain solution.
10. System cleaner that remains in the rollers will contaminate the processing solutions.

Problem Solving



In the Operator Manual, read the section “Problem Solving.” Fill in the blanks with the appropriate information to help you study this topic.

NOTE: The Operator Manual contains problem solving information that can be used by the operator to diagnose some basic problems. If you need more detailed information on how to diagnose more serious errors, consult the Diagnostics Manual.



Fill In Practice Exercise

1. The 3 indicators on the display panel identify the status of the processor. If “Ready” is On, “Wait” is On, and “Service” is Off, then

“Ready” is On, “Wait” is Off, and “Service” is Off, then _____.

2. If the temperature of the developer is over the set-point temperature and the Wait indicator blinks once, the operator should check that the main water supply to the processor is: _____ and _____.

3. The operator should record the blink pattern in the service log book and then call for service any time the _____ indicator is illuminated.

4. The operator should always note the status of the _____ on the display panel before calling for service.

5. If transport failure, surface artifacts, and wet films occur, operators should remove any dirt from the _____ and _____ by rinsing them with water.

16. Dryer air vane switch S4 senses dryer air temperature changes when resistance variations develop across its terminals.
- True
 - False
17. The AC safety interlock switch S5 _____.
- is located on the drive side of the processor
 - prevents the processor from operating while the top cover is off the processor
 - is located near the dryer rack
 - All of the above are correct
18. Temperature changes in the developer solution affect the resistance of developer thermistor RT1.
- True
 - False
19. The fixer system _____.
- converts the invisible latent image on the film to a visible image
 - circulates heated air across the film surfaces
 - removes excess chemical solutions from both sides of the film
 - stops the continued development of the visible image by removing unexposed silver halide crystals on the film
20. Which processor model would you recommend to a low-film-usage veterinary clinic?
- M43
 - M43A
 - Clinic 1
21. It is not recommended to install a Clinic 1 Processor in a main radiology department of a hospital.
- True
 - False

Warranty



Read the section “Warranty” in either the Site Specifications or the Operator Manual.

Remember the points highlighted below.

- 1 year warranty extends from the date of initial installation, when installed within one year from date of shipment.
- Warranty repair service includes any adjustments and/or replacement of parts required to maintain the equipment in good working order during Kodak’s normal working hours.
- The warranty does not cover attachments, accessories and alterations not made by Kodak or its authorized agents.
- For continued warranty coverage, the user must follow the operating instructions as recommended by Kodak.

Self Evaluation

Answer the following multiple choice questions to evaluate your understanding of the OPERATION module.

Note:

- Check the **answer key** for the correct answers.
- You should answer at least **8 out of 10** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 4 again if you answered more than 2 questions incorrectly.

Multiple Choice Test

Module 4 Course Evaluation

See the answer key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. Before adding fresh chemicals to an empty processor, you should make sure the _____.
 - a. wash drain valve is fully open
 - b. wash drain valve is fully closed
 - c. developer and fixer drain valves are fully open
 - d. developer and fixer drain valves are fully closed
2. When filling both the developer and fixer tanks, fill the _____ first.
 - a. developer tank
 - b. fixer tank
3. With the racks in place, fill the fixer and developer tanks until the solution level _____.
 - a. reaches the top of the entrance roller
 - b. reaches the fill mark on the splash guard
 - c. just touches the bottom of the entrance roller
 - d. is at the top of the overflow weir

4. You can identify the developer rack by _____.
- the red gears
 - the red mark on the entrance roller
 - the red wire tie
 - the special pitch to the gears which only mate with the drive gears on the drive shaft
5. Allow the processor to operate _____ to mix the developer and starter solutions.
- at least 30 seconds
 - at least 40 seconds
 - at least 50 seconds
 - at least 60 seconds
6. If the Ready indicator illuminates and neither the Wait indicator nor the Service indicator is illuminated or blinking, you should wait until the Ready indicator blinks before feeding film.
- True
 - False
7. Turn the dryer temperature control knob _____ to increase the set-point temperature for the dryer. Wait _____ for the dryer to reach its new set-point temperature.
- clockwise 4 minutes
 - counterclockwise 4 minutes
 - clockwise 5 minutes
 - counterclockwise 5 minutes
8. All film except _____ is fed square with the **left** edge of the film guide.
- 10 x 10 cm (4 x 4 in.)
 - 35 x 43 cm (14 x 17 in.)
 - 18 x 24 cm (8 x 10 in.)
 - 18 x 43 cm (8 x 17 in.)

9. If the Ready and Wait indicators on the display panel are Off, and the Service indicator is blinking 10 times, the operator should _____.
- a. Check that the room ambient temperature is within 15° and 30°C (59° and 86°F).
 - b. Check for excessive negative static pressure at the exhaust vent.
 - c. Turn the processor off, wait 5 seconds and energize the processor.
 - d. All of the above
10. If the Ready and Wait indicators on the display panel are Off, and the Service indicator is blinking 8 times, the operator should check for excessive negative static pressure at the exhaust vent.
- a. True
 - b. False

Multiple Choice Test - Answer Key

Check your answers to the Module 4 Course Evaluation. Review Module 4 again if you did not answer 8 out of 10 questions correctly.

Module 4 Course Evaluation Answers

- (1) d. developer and fixer drain valves are fully closed.
- (2) b. fixer tank first
- (3) d. is at the top of the overflow weir.
- (4) c. the red wire tie.
- (5) d. at least 60 seconds
- (6) b. false
- (7) c. clockwise 5 minutes
- (8) a. 10 x 10 cm (4 x 4 in.)
- (9) d. all of the above
- (10) b. False

DIAGNOSTICS

Objectives

After completion of this training module, students will be able to accomplish the tasks listed below:

- Evaluate error codes and describe diagnostic routines associated with them.
- Use the publications along with experience and common sense to analyze problems and find solutions to return the processor to proper operation.

General Description of Errors



In the Diagnostic Manual, read the section “General Description of Errors.” Fill in the blanks with the appropriate information to help you study these topics.



Fill In Practice Exercise

1. When 2 or more errors occur at the same time, only the _____ error will be shown on the display panel.
2. Processing films during an error or non-standard condition may affect the _____.
3. If a sheet of film is in transit through the processor when a fatal error 03 occurs, the sheet of film _____ from the processor, the processor will shut down, and the processor will not accept _____.
4. An operator can sometimes correct a _____ error. When the processor exhibits this type of error, the processor attempts to correct the problem without entering into a _____.
5. A _____ is any error that the operator may be able to correct. This error normally does not prevent the processor from accepting film.

General Description of Errors (Continued)



Fill In Practice Exercise Answers

1. When 2 or more errors occur at the same time, only the highest priority will be shown on the display panel.
2. Processing films during an error or non-standard condition may affect the image quality.
3. If a sheet of film is in transit through the processor when a fatal error 03 occurs, the sheet of film exits from the processor, the processor will shut down, and the processor will not accept any more sheets of film.
4. An operator can sometimes correct a non-fatal error. When the processor exhibits this type of error, the processor attempts to correct the problem without entering into a protective mode.
5. A warning is any error that the operator may be able to correct. This error normally does not prevent the processor from accepting film.

Running Service Routines



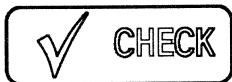
In the Diagnostic Manual, read the section “Running Service Routines.” Fill in the blanks with the appropriate information to help you study these topics.



Fill In Practice Exercise

1. When switches 1 - 5 are off, no _____ are running.
2. Place the switches in the following positions to energize the wash pump:
Switch 1 = _____
Switch 2 = _____
Switch 3 = _____
Switch 4 = _____
Switch 5 = _____
3. In the diagnostic mode, switch 1 is always in the _____ position.
4. Remove the _____ before performing the service routine for the developer heater.
5. You place film under film sensors 1, 2, and 3 when performing the service routine for the _____.
6. The _____ will sound 5 seconds after you move switches 1, 3, and 5 on S1 in the electrical box to the On position.

Running Service Routines (Continued)



Fill In Practice Exercise Answers

1. When switches 1 - 5 are off, no service routines are running.
2. Place the switches in the following positions to energize the wash pump:
Switch 1 = ON
Switch 2 = OFF
Switch 3 = ON
Switch 4 = OFF
Switch 5 = OFF
3. In the diagnostic mode, switch 1 is always in the On position.
4. Remove the developer rack before performing the service routine for the developer heater.
5. You place film under film sensors 1, 2, and 3 when performing the service routine for the film sensors.
6. The audio alarm will sound 5 seconds after you move switches 1, 3, and 5 on S1 in the electrical box to the On position.

Operating Conditions



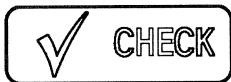
In the Diagnostic Manual, read the section “Operating Conditions.” Fill in the blanks with the appropriate information to help you study these topics.



Fill In Practice Exercise

1. You are diagnosing Error 11 and have determined the developer thermistor is operating correctly. You would next check to see if the _____ is operating correctly.
2. You are diagnosing Error 13 and you determine the resistance of the dryer thermistor is 15% higher than the value in the resistance and voltage values table at several temperature settings. You should/should not replace the thermistor.
3. When the Ready and Wait indicators are Off and Service indicator is On and not blinking, you should open the electrical box and set service switches _____ to the Off position.
4. To check if the dryer blower is de-energizing, turn the dryer temperature control knob to the _____ position. The blower should de-energize when the processor enters _____.
5. The _____ energizes to create air flow. If it does not the processor should indicate _____.
6. If the dryer blower energizes and the status indicators indicate Error 03, the problem is probably with the _____.

Operating Conditions (Continued)



Fill In Practice Exercise Answers

1. You are diagnosing Error 11 and have determined the developer thermistor is operating correctly. You would next check to see if the **developer heater** is operating correctly.
2. You are diagnosing Error 13 and you determine the resistance of the dryer thermistor is about 15% higher than the value in the resistance and voltage values table at several temperature settings. You **should** replace the thermistor.
3. When the Ready and Wait indicators are Off and Service indicator is On and not blinking, you should open the electrical box and set service switches **1-5** to the Off position.
4. To check if the dryer blower is de-energizing, turn the dryer temperature control knob to the **lowest** position. The blower should de-energize when the processor enters **standby mode**.
5. The **dryer blower** energizes to create air flow. If it does not the processor should indicate **Error 02**.
6. If the dryer blower energizes and the status indicators indicate Error 03, the problem is probably with the **air vane switch**.

Mechanical Diagnostics



In the Diagnostic Manual, read the section “Mechanical Diagnostics.” This includes the “Quick Reference” and the “In Detail” topics. Fill in the blanks with the appropriate information to help you study these topics.



Fill In Practice Exercise

1. The quick reference shows the variety of symptoms that can arise from a single cause. For instance if the drain valves are not completely closed or if replenishment is not working correctly you may see symptoms in all of/none of the mechanical diagnostic categories.
2. Diagnostics call for good observations and common sense. You may have a customer who claims that they have a replenishment problem since they are observing abnormal densities and poor image quality. However, by observing that the drive motor is unusually warm and the transport speed is slow (leading edge of the film in to trailing edge of the film out is over $2\frac{1}{2}$ minutes) you determine the problem is more likely a _____ failure.
3. Developer temperature being out of range and a malfunctioning film sensor both create _____ as a symptom. Both conditions should create an error condition on the _____ to help you determine the actual cause of the problem.
4. You are seeing surface artifacts and abnormal densities in a customer’s film after development. When checking the recirculation system you check the _____ to determine if it is kinked or airlocked.

Mechanical Diagnostics (Continued)



Fill In Practice Exercise Answers

1. The quick reference shows the variety of symptoms that can arise from a single cause. For instance if the drain valves are not completely closed or if replenishment is not working correctly you may see symptoms in all of the mechanical diagnostic categories.
2. Diagnostics call for good observations and common sense. You may have a customer who claims that they have a replenishment problem since they are observing abnormal densities and poor image quality. However, by observing that the drive motor is unusually warm and the transport speed is slow (leading edge of the film in to trailing edge of the film out is over 2½ minutes) you determine the problem is more likely a transport failure.
3. Developer temperature being out of range and a malfunctioning film sensor both create abnormal film densities as a symptom. Both conditions should create an error condition on the display panel to help you determine the actual cause of the problem.
4. You are seeing surface artifacts and abnormal densities in a customer's film after development. When checking the recirculation system you check the tubing to determine if it is kinked or airlocked.

Self Evaluation

Answer the following multiple choice questions to evaluate your understanding of the PRODUCT OVERVIEW module.

Note:

- Check the **answer key** for the correct answers.
- You should answer at least **8 out of 10** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 3 again if you answered more than 2 questions incorrectly.

Multiple Choice Test

Module 5 Course Evaluation

See the Answer Key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. An error which causes the processor to enter a protective mode to prevent a hazardous condition is called a _____.
 - a. Warning
 - b. Protective Mode Error
 - c. Non-Fatal Error
 - d. Fatal Error
2. Switch 1 on the 100 circuit board has _____ DIP switches, each of which has _____ positions.
 - a. 6 2
 - b. 5 3
 - c. 5 2
 - d. 6 3
3. DIP switches _____ on S1 are used to select the desired service routine.
 - a. 1 through 5
 - b. 2 through 5
 - c. 1 through 4
 - d. 1 through 3, and 5

4. Water circulation can most easily be checked by _____.
- observing bubbles forming around the developer heater
 - using a thermometer to check if the fixer temperature is increasing
 - observing the wash tubes in the wash rack
 - checking for a voltage drop across the terminals of the water input solenoid
5. The service routine for the film sensors illuminates all 3 status indicators on the display panel when one of the film sensors is blocked.
- True
 - False
6. While observing the processor operate in standby mode, you observe that both the blower motor for the dryer and the main drive motor energize intermittently. You _____ be concerned since this is _____ for standby mode.
- should not normal operation
 - should abnormal operation
7. Your associate is leaving to repair a Clinic 1 Processor which is displaying Error Code 04. Your associate plans on taking a new developer thermistor to replace the existing one. Based on the information in the Diagnostic Manual, you suggest taking a new _____ as well.
- SSR-U1 and a 100 circuit board
 - SSR-U1 and a developer heater
 - SSR-U3 and a developer heater
 - SSR-U3 and a 100 circuit board

8. Your associate receives an early morning call stating an M43 Processor is displaying Error 11. You say it is very possible to solve this error over the phone if the operator did not _____.
- wait long enough for the processor to warm up properly
 - wait for the room temperature to go over 15°C (59°F)
 - turn on the main water supply to the processor
 - turn off the main water supply to the processor
9. Your associate returns from a service call and discovers that the same customer has just called stating the Ready and Wait indicators are Off and the Service indicator is On. What is the most probable cause?
- Your associate forgot that only the highest priority error is shown on the display panel and did not repair all the malfunctions.
 - Your associate did not set DIP switch 1 on S1 in the 100 circuit board to the Off position.
 - Your associate did not set DIP Switch 1 on S1 in the 100 circuit board to the On position.
 - Your associate did not seat the dryer heater correctly on the dryer plenum.
10. To energize the _____, place the S1 DIP switches in the following positions:
- Switch 1 = **ON**
- Switch 2 = **ON**
- Switch 3 = **ON**
- Switch 4 = **OFF**
- Switch 5 = **OFF**
- film sensors
 - developer temperature display
 - status indicators
 - developer heater

Multiple Choice Test - Answer Key

Check your answers to the Module 5 Course Evaluation. Review Module 5 again if you did not answer 8 out of 10 questions correctly.

Module 5 Course Evaluation Answers

- (1) d. Fatal Error.
- (2) c. 5 2
- (3) b. 2 through 5
- (4) c. observing the wash tubes in the wash rack.
- (5) b. False
- (6) a. should not normal operation
- (7) d. SSR-U3 and a 100 circuit board
- (8) c. turn on the main water supply to the processor.
- (9) b. Your associate did not set DIP switch 1 on S1 in the 100 circuit board to the Off position.
- (10) d. developer heater

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SERVICE

Objectives

After completion of this training module, students will be able to accomplish the tasks below:

- Identify special tools required to service the processor.
- Identify and use ESD and safety precautions for the processor.
- Identify and interpret processor electrical wiring diagrams in the Service Manual.
- Describe the removal, replacement, and adjustment of assemblies and components within the processor, given access to the Service Manual.

Introduction



In the Service Manual, read the section “Introduction.” This section includes topics about “Electrostatic Discharge,” “Required Special Tools,” “Overview of the Processor,” “Energizing the Processor,” “De-energizing the Processor,” and “Draining the Processor Tanks.” Fill in the blanks with the appropriate information to help you study these topics.



Fill-In Practice Exercise

1. A static charge of as few as _____ volts can damage or destroy essential components in electronic equipment.
2. Wear a _____ when handling static sensitive components.
3. Use _____ packaging when transporting static-sensitive components from one area to another.
4. The 4 access panels and the _____ cover are often removed before many procedures are begun.



Fill-In Practice Exercise Answers

1. A static charge of as few as 30 volts can damage or destroy essential components in electronic equipment.
2. Wear a grounding strap when handling static sensitive components.
3. Use ESD-protective packaging when transporting static-sensitive components from one area to another.
4. The 4 access panels and the top cover are often removed before many procedures are begun.

Racks



In the Service Manual, read the section “Racks.” Fill in the blanks with the appropriate information to help you study these procedures.



Fill-In Practice Exercise

1. You must _____ the developer rack from the processor and place it on a smooth, flat surface before you can adjust the rack for _____.
2. Colored _____ are used to identify the developer and the fixer racks.
3. When removing a plastic roller, you remove the _____ from each end of the roller by inserting a screwdriver in the _____ at the base of the stud and then prying the stud loose.
4. In the wash rack, a drive roller and a _____ make up a roller pair.
5. When removing a wash tube, push the tab on the wash tube towards the _____ side of the wash rack.
6. The dryer rack contains a quantity of _____ air tubes.
7. In the dryer rack, the dryer roller pairs have a _____ and a driven roller, just as in the wash rack.
8. The tension on the drive belt in the dryer is correct when the belt is _____ and does not _____.



Fill-In Practice Exercise Answers

1. You must remove the developer rack from the processor and place it on a smooth, flat surface before you can adjust the rack for squareness.
2. Colored wire ties are used to identify the developer and the fixer racks.
3. When removing a plastic roller, you remove the stud from each end of the roller by inserting a screwdriver in the notch at the base of the stud and then prying the stud loose.
4. In the wash rack, a drive roller and a driven roller make up a roller pair.
5. When removing a wash tube, push the tab on the wash tube towards the drive side of the wash rack.
6. The dryer rack contains a quantity of 8 air tubes.
7. In the dryer rack, the dryer roller pairs have a drive roller and a driven roller, just as in the wash rack.
8. The tension on the drive belt in the dryer is correct when the belt is tight and does not slip.

Dryer



In the Service manual, read the section “Dryer.” Fill in the blanks with the appropriate information to help you study these procedures.



Fill-In Practice Exercise

1. The dryer thermistor is located in the _____.
2. Before removing the dryer plenum, remove the dryer rack and the _____ rack, and disconnect the connectors.



Fill-In Practice Exercise Answers

1. The dryer thermistor is located in the **dryer plenum**.
2. Before removing the dryer plenum, remove the dryer rack and the **wash** rack, and disconnect the connectors.

Main Drive



In the Service Manual, read the section “Main Drive.” Fill in the blanks with the appropriate information to help you study these procedures.



Fill-In Practice Exercise

1. The drive gear is secured on the main drive shaft with a _____.

2. A special tool is used to remove the _____ securing each of the worms.

3. To tighten the drive chain, loosen the _____ for the drive motor and move the motor _____.



Fill-In Practice Exercise Answers

1. The drive gear is secured on the main drive shaft with a setscrew.

2. A special tool is used to remove the pin securing each of the worms.

3. To tighten the drive chain, loosen the mounting screws for the drive motor and move the motor down.

Plumbing



In the Component Locator, find the figure showing the location of the developer (B5) and the fixer (B6) recirculation pumps. Then find the figure showing the location of the developer/fixer replenishment pump. See the Service Manual and find the procedure for “Removing the Recirculation Pumps and the Replenishment Pump.”

PRACTICE EXERCISE

Fill in the blanks with the appropriate information to help you study the procedure for removing the recirculation pumps and the replenishment pump.

Fill-In Practice Exercise

1. Before removing the feed tray, you should _____ the processor and disconnect _____.
2. To gain access to the hose clamps of the recirculation pumps, slide out the _____ from the drive side of the processor.
3. To prevent leakage of developer and fixer solution, install _____ on the hoses before removing them from the pumps.



Fill-In Practice Exercise Answers

1. Before removing the feed tray, you should de-energize the processor and disconnect main power.
2. To gain access to the hose clamps of the recirculation pumps, slide out the electrical box from the drive side of the processor.
3. To prevent leakage of developer and fixer solution, install hose clamps (TL2170) on the hoses before removing them from the pumps.



In the Component Locator, find the illustration showing the location of the developer heater (HR1). Next, read “Removing the Developer Heater (HR1)” in the Plumbing section of the Service Manual. Fill in the blanks with the appropriate information to help you study the procedure for removing the developer heater (HR1).

**PRACTICE
EXERCISE**

Fill-In Practice Exercise

1. To remove the developer heater, disconnect _____ before removing the 3 screws securing the developer heater to the inside of the _____.



Fill-In Practice Exercise Answers

1. To remove the developer heater, disconnect connector P/J8 before removing the 3 screws securing the developer heater to the inside of the developer tank.



In the Component Locator, find the illustration showing the location of the developer thermistor (RT1). Next, read “Removing the Developer Thermistor (RT1)” in the Plumbing section of the Service Manual. Fill in the blanks with the appropriate information to help you study the procedure for removing the developer thermistor (RT1).

**PRACTICE
EXERCISE**

Answer the following questions about the procedure for removing the developer thermistor (RT1).

Fill-In Practice Exercise

1. The developer thermistor is located in the _____.
2. The developer thermistor uses an _____ seal to prevent leakage as does the developer heater.

**Fill-In Practice Exercise Answers**

1. The developer thermistor is located in the **developer tank**.
2. The developer thermistor uses an **o-ring** seal to prevent leakage as does the developer heater.



In the Component Locator, find the figures showing the location of the drain valves, the water input solenoid valve (L1), the diverter valve, and the heat exchanger.



In the Service Manual, read the section “Plumbing.” Study the procedures for removing the drain valves, the water input solenoid valve (L1), and the diverter valve (L2) or (L3) in the M43 and M43A Processors. Also review the procedure for removing the heat exchanger.

Electrical

WARNING: Dangerous Voltages

Qualified personnel only, using proper test equipment and following strict ESD and safety guidelines, should perform procedures requiring the testing or removal and replacement of circuit boards, wire harnesses, or electrical components.

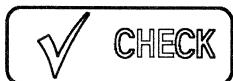


In the Service Manual, study the procedures in the “Electrical” section. Fill in the blanks with the appropriate information to help you study these procedures.

PRACTICE EXERCISE

Fill-In Practice Exercise

1. Fasten the top cover of the electrical box by placing the _____ on the processor tank around the _____ on the electrical box cover.
2. There are _____ cables connected to the 100 circuit board.



Fill-In Practice Exercise Answers

1. Fasten the top cover of the electrical box by placing the o-ring on the processor tank around the post on the electrical box cover.
2. There are 7 cables connected to the 100 circuit board.

Wiring Diagrams

WARNING: Dangerous Voltages

Qualified Personnel only, using proper test equipment and following strict ESD and safety guidelines, should perform procedures requiring the removal and replacement of circuit boards, wire harnesses, or electrical components.



In the Diagram Package, review the diagrams for the processors. Fill in the blanks with the appropriate information to help you study these diagrams.

PRACTICE EXERCISE

Fill-In Practice Exercise

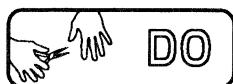
1. The developer heater assembly (HR1) has an internal _____ protection circuit. The internal circuit opens if the heater is over 57°C (135°F).
2. The main power wires are connected to _____.
3. Interlock switch S5 is wired in series. Dryer air flow switch S4 is wired in _____ since it opens the circuit when there is no air flow from the dryer blower.
4. The maximum resistance of the dryer potentiometer R3 is _____.
5. Extraneous voltage spikes and internally generated radio frequencies are removed from the incoming power supply by _____.
6. The solenoid(s) is/are energized by _____ volts DC.
7. The DC power supply provides _____, _____, and _____ volts DC.
8. The purpose of the T1 transformer is to convert line voltage to _____ volts _____.
9. The interlock switch S6 is included on all processors having a serial number of _____ or higher or having Mod. 1 installed.

10. To adjust the developer temperature, use component _____ located on the 100 circuit board.
11. The DC voltages that you can measure at the test points on the 100 circuit board are:
- _____
- _____
- _____
- _____
12. Jumper _____ controls normal and flooded replenishment.
13. The _____ model processor contains only 1 heat exchanger.
14. The developer temperature heater is _____ watts.
15. Fuse F2 is used to protect the _____.



Fill-In Practice Exercise Answers

1. The developer heater assembly (HR1) has an internal over temperature protection circuit. The internal circuit opens if the heater is over 57°C (135°F).
2. The main power wires are connected to TB1.
3. Interlock switch S5 is wired in series. Dryer air flow switch S4 is wired in series, since it opens the circuit when there is no air flow from the dryer blower.
4. The maximum resistance of the dryer potentiometer R3 is 10KΩ (10 thousand ohms).
5. Extraneous voltage spikes and internally generated radio frequencies are removed from the incoming supply by line filter FL1.
6. The solenoid(s) is/are energized by 20 volts DC.
7. The DC power supply provides +15, -15, and +5 volts DC.
8. The purpose of the T1 transformer is to convert line voltage to 20 volts AC.
9. The interlock switch S6 is included on all processors having a serial number of 350 or higher or having Mod. 1 installed.
10. To adjust the developer temperature, use component R25 located on the 100 circuit board.
11. The DC voltages that you can measure at the test points on the 100 circuit board are:
TP26 = 20 V,
TP31 = 5 V,
TP33 = 15 V, and
TP35 = -15 V
12. Jumper E1 controls normal and flooded replenishment.
13. The Clinic 1 model processor contains only 1 heat exchanger.
14. The developer temperature heater is 850 watts.
15. Fuse F2 is used to protect the DC power supply.

Ordering Publications or Accessories:

Remove the “Listing of all Publications for the *Kodak X-Omat M43, M43A, and Clinic 1 Processors*” from the inside pocket on the front cover of the publications binder. Notice its layout and content. Use the fill in questions to help you study this topic.

**Fill In Test**

1. To receive the publications binder and its entire contents order pub. no. _____.
2. To receive a Theory Guide, order pub. no. _____.
3. To replace a lost set of Installation Instructions for the Lighttight Feed Tray Kit order pub. no. _____.

**Fill-In Practice Exercise Answers**

1. To receive the publications binder and its entire contents order pub. no. 981097.
2. To receive a new Theory Guide, order pub. no. 981095.
3. To replace a lost set of Installation Instructions for the Lighttight Feed Tray Kit order pub. no. 1C0937.

Self Evaluation

Answer the following multiple choice questions to evaluate your understanding of the SERVICE module.

Note:

- Check the **answer key** for the correct answers.
- You should answer at least **8 out of 10** questions correctly.
- Make sure you agree with the correct answers before proceeding.
 - Review Module 6 again if you answered more than 2 questions incorrectly.

Multiple Choice Test

Module 6 Course Evaluation

See the answer key for the correct answers.

Choose the best answer to each question out of the selections provided.

1. A primary source of product downtime, frustrating equipment failures, and intermittent operation for electronic equipment is _____.

 - a. incorrect operating voltages
 - b. poorly designed power supplies
 - c. ESD
 - d. power brownouts
2. When removing the wash rack assembly, do not hold the wash rack by the tie rods.
 - a. True
 - b. False
3. You are working on the entrance roller assembly for the wash rack. After removing the bearing block you remove the 2 bearings and the _____ as an assembly.

 - a. e-rings
 - b. spring
 - c. spacers
 - d. washers

4. Before disassembling the drive end of the exit squeegee roller assembly you note you need _____ remove the 2 spiro pins.
 - a. to pull evenly to
 - b. to rotate the shafts toward the ground to
 - c. a special tool (TL-1388) to
 - d. to remove the 2 spacers before you
5. When cleaning a wash tube place the open end of the tube directly under the stream of water and observe that water _____.
_____.
 - a. exits equally from all the holes in the wash tube
 - b. pulses out of the wash tube intermittently
 - c. barely comes out of the holes due to the lack of pressure
 - d. flows more freely from the larger outer holes
6. During a service call you notice the developer rack doesn't seat properly, even though you try to reseat it. You should remove the rack and do the procedure to adjust the squareness of the rack.
 - a. True
 - b. False
7. The recirculation pump assembly for the M43A and Clinic 1 Processors has the same part number.
 - a. True
 - b. False
8. The M43A and Clinic 1 Processors generally draw less current than the M43 processor.
 - a. True
 - b. False
9. The service indicator lamps (DS1 - DS3) operate off of +5 V DC.
 - a. True
 - b. False

10. The cathode for film sensor U7 is on Pin 5 of J14 and is a _____ wire.

- a. white
- b. blue
- c. brown
- d. black

Multiple Choice Test - Answer Key

Check your answers to the Module 6 Course Evaluation. Review Module 6 again if you did not answer 8 out of 10 questions correctly.

Module 6 Course Evaluation Answers

- (1) c. ESD
- (2) a. True Otherwise the exit squeegee rollers can fall out and become damaged.
- (3) b. spring
- (4) c. a special tool (TL-1388) to
- (5) a. exits equally from all the holes in the wash tube
- (6) a. True
- (7) a. True
- (8) b. False
- (9) a. True
- (10) d. black

TRAINING OPERATORS

Objectives

After completion of this training module, students will be able to accomplish the tasks below:

- Use the Training Outline to instruct processor operators in the recommended procedures for the operation and routine maintenance (including replenishment rate calibration) of the processor.
- Provide on-site, one-on-one training.
- Evaluate operator competency in meeting the operator objectives.

When they complete this training the operators will be able to accomplish the tasks below:

- Describe several reasons why quality service is important.
- Locate the controls and indicators required for operating the processor and briefly describe their purpose.
- Describe the film feed signal and the display indicator feedback an operator sees before and during film feed.
- Describe the features incorporated into the processor for operator safety.
- Describe the start-up procedure.
- Describe the shutdown procedure.
- Perform the replenishment rate calibration procedure when required.
- Clean and inspect the processor as specified in the Operator Manual on a daily and periodic basis.
- Recognize display panel indicator patterns which are associated with normal operation, recoverable error conditions, and fatal error conditions.

Training Outline

Refer to this outline when providing on-site training for operators.

- **Why is quality service important.**

- Trained personnel do the job right the first time.
- Experience translates to quicker diagnosis and repair and maximizes “up time.”
- Experienced personnel can determine whether the operator is using the equipment correctly and update his/her training on-site.
- Experienced personnel can prescribe changes to the setup of the machine or the use of Kodak chemicals or accessories that can further optimize the operation of the equipment.
- Properly operating equipment provides consistent image quality which equates to quality health care for the patient.
- Excellent Service results in extended service life for the equipment.

- **Overview of the Processors Controls and Indicators.**

- Ready Indicator
 - Indicates that the processor is ready to accept film
- Wait Indicator
 - Blinking = processor has not reached optimum conditions but will accept film
 - Solid = Film was fed, but has not yet cleared the feed tray
- Service Indicator
 - Blinking = processor has an error condition the operator may be able to correct, but most often requires service
 - Solid = processor is in a protected mode, call your service provider

Feedback Exercise

- Have the operator describe the purpose of the Ready, Wait, and Service indicators.

- Explain Customer Setup Options

- Replenishment Mode

- Normal replenishment is used at most sites
 - Flooded replenishment is used to assure consistent film processing in very low film-usage applications

(See Recommended Replenishment Rates Sheet, Pub. No. 1C0578)

- Temperature Display - Choose between:

- °F
 - °C

- Processor Status Between Film Feeds

- Standby mode conserves energy, used in most installations
 - Continuous mode assures consistent film processing in a wide variety of environmental conditions

Feedback Exercise

- Have the operator describe the setup options for his/her machine.

- Explain to the operator the film feed signal, the display indicator feedback, and other visual and auditory feedback they should experience before or while feeding a film.

- Film Feeding (Demonstrate live if possible)

- Explain the importance of feeding all films except 10 x 10 cm (4 x 4 in.) square with the **left** edge of the film guide.
 - Explain the importance of feeding 10 x 10 cm (4 x 4 in.) film square with the **right** edge of the film guide.
 - Explain the importance of waiting for the film feed signal to beep and the Wait indicator to turn Off before feeding another sheet of film.
 - Explain the importance of feeding single-emulsion films with the emulsion-side up

Feedback Exercise

- Provide test film of various sizes (including 10 x 10 cm [4 x 4 in.]) and observe the operator feed the film against the correct film guide.

- **Describe the safety features incorporated into the processor and demonstrate safe practices for operating and maintaining the processor.**

- Remove the top cover and show the location of the safety interlock switches S5 and S6 (for processors with serial number 350 or above or with mod. 1 is installed).
 - The processor is de-energized when the cover is removed.
 - Dropping the top cover onto the processor can damage switch S5.
- Describe the use of protective glasses, gloves, and clothing when filling the fixer and developer tanks.
- If the customer has a splash guard or drip tray demonstrate their use.
- Emphasize the importance of filling the fixer tank before the developer tank.
 - Small amounts of fixer can seriously contaminate the developer.

Feedback Exercise

- Have the operator describe the consequence of mixing fixer solution into the developer solution.
- (Optional) Have the operator demonstrate how to fill the tanks.

- **Describe the Start-Up Procedures.**

- Check the level of developer and fixer solution in the processing tanks and replenish the solutions if necessary.
- Check to see if the evaporation covers are installed and seated correctly.
- Check to see if the top cover is installed and seated correctly.
- Close the wash drain.
- Turn on the water supply.
- Check the level of developer and fixer in the replenishment tanks.
- Check that the feed tray is clean and free of lint.
- Energize the processor.
 - Describe the wait period that occurs while the developer solution and the dryer heater plenum reach operating temperatures.
 - Describe the indicator light status they will see when the processor is ready for film feed. (“Ready” illuminates, “Wait” turns off)
- Test the operation of the processor with a sheet of test film.

Feedback Exercise

- Have the operator perform the start-up procedure.
- Have the operator describe the reason for the wait period that occurs before the Ready indicator illuminates during the start-up procedure.

- **Describe the shutdown procedures.**

- De-energize the processor.
- Turn off the main power.
- Turn off the water supply.
- Open the wash drain.
- Do the “Daily Cleanup” procedure as outlined in the Operator Manual.

Feedback Exercise

- Have the operator perform the shutdown procedure as outlined in the Operator Manual.

- **Describe the Replenishment Calibration procedure.**

- Point out the location of the Recommended Replenishment Rates Sheet, Publication Number (1C0578).
 - Discuss the “use condition” categories and provide recommendations based on the film volume and film intermix used at that site.
 - Discuss the set up of the pumps to provide proportional volumes of developer and fixer replenishment solutions.
- Demonstrate how to enter the replenishment calibration check mode.
- Demonstrate how to use the graduated cylinder to measure the replenishment volume for the developer and fixer solutions.
 - Show how to use the middle film sensor for measuring replenishment volumes.
 - Show how to increase the rate of developer and fixer replenishment by 5 ml using the **right (+) film sensor**.
 - Show how to decrease the rate of developer and fixer replenishment by 5 ml using the **left (-) film sensor**.
 - Discuss the formula (Developer x Ratio = Fixer Rate) and how to determine whether the ratio is between 1.20 (low volume) and 1.42 (high volume)

Feedback Exercise

- Verify that the operator can perform the replenishment calibration check procedure with minimum instructor guidance.
- Ask the operator how many millilitres the replenishment volume increases when the **right (+) film sensor** is blocked.
- Discuss with the operator the proper method for discarding the replenishment solution obtained during the replenishment calibration check procedure. Discuss local codes.

- **Demonstrate how to clean and inspect the processor as specified in the Operator Manual.**
 - Demonstrate the daily cleanup procedure.
 - Discuss the use of rubber gloves, safety glasses and protective clothing during weekly preventive maintenance procedures.
 - Discuss the timetable and rationale for performing more thorough preventive maintenance cleaning and inspection procedures.
 - Discuss the occasional use of *Kodak* Developer System Cleaner for cleaning the developer rack rollers and developer tank.
 - Discuss the occasional use of *Kodak* Fixer/Wash System Cleaner for cleaning the fixer rack rollers and fixer tank.
 - Discuss the use of chlorine bleach to remove any biological growth in the wash system.
 - Show the operator how to inspect and clean the dryer area.
 - Show the operator how to inspect the seating of the racks and the meshing of the drive gears with the worms and to correct any misalignment in these areas.
 - Refer the operator to the chemical usage instructions printed on the packaging.
 - Refer the operator to the additional information such as flooded replenishment, factory default settings, and error code information provided on the Recommended Replenishment Rates sheet.

Feedback Exercises

- Verify that the operator can perform the daily cleaning procedure.
- Ask the operator to list three areas he/she should inspect periodically to determine whether cleaning is required.

- **Describe display panel indicator patterns which are associated with normal operation, recoverable error conditions, and fatal error conditions.**

- Refer the operator to the Recommended Replenishment Rates sheet.
 - Show the operator the error condition - blink patterns tables.
- Demonstrate status indicator patterns appearing on the display panel.
 - the blinking **Wait** indicator pattern that occurs when the developer is under the set-temperature.
 - the illumination of the **Service** indicator that occurs when diagnostic switch 1 on S1 is left in the On position.

Feedback Exercise

- Verbally describe several status indicator blink patterns and see if the operator can correctly identify their meaning. Provide the operator with access to the appropriate tables in the Operator Manual.
- Ask the operator to describe at least one status indicator pattern that indicates service is required. Provide the operator with access to the appropriate table in the Operator Manual.

- **Discuss the following miscellaneous topics:**

- Considerations for determining the set-point temperature for the dryer, i.e. single emulsion films, other manufacturer's films.
- Back-to-back film feeding in Clinic 1 installations.
- Processor's built-in venting through the dryer exit slot eliminates the need to remove top cover nightly.
- Less water usage
- Duration of the Standby Mode Cycle - repeats every 5 minutes.
- Possibility of the blower energizing while the processor is in Standby Mode if cooling of the developer is required.
- Importance of noting the blink patterns of the 3 status indicators before making a call for service.
- Availability of accessories and processor setup options.

M43/M43A and Clinic 1 Processor Operator Training Checklist

Kodak X-Omat M43/M43A or Clinic 1 Processor Operator Training	
The operator was provided an overview of quality service.	<input type="checkbox"/>
The operator is able to locate controls and indicators.	<input type="checkbox"/>
The operator is able to do the start-up procedure.	<input type="checkbox"/>
The operator is able to feed film into the processor correctly.	<input type="checkbox"/>
The operator is able to calibrate replenishment volumes.	<input type="checkbox"/>
The operator is able to do the shutdown procedure.	<input type="checkbox"/>
The operator was provided an overview of cleaning and inspection fundamentals.	<input type="checkbox"/>
The operator is able to recognize status indicator patterns.	<input type="checkbox"/>

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